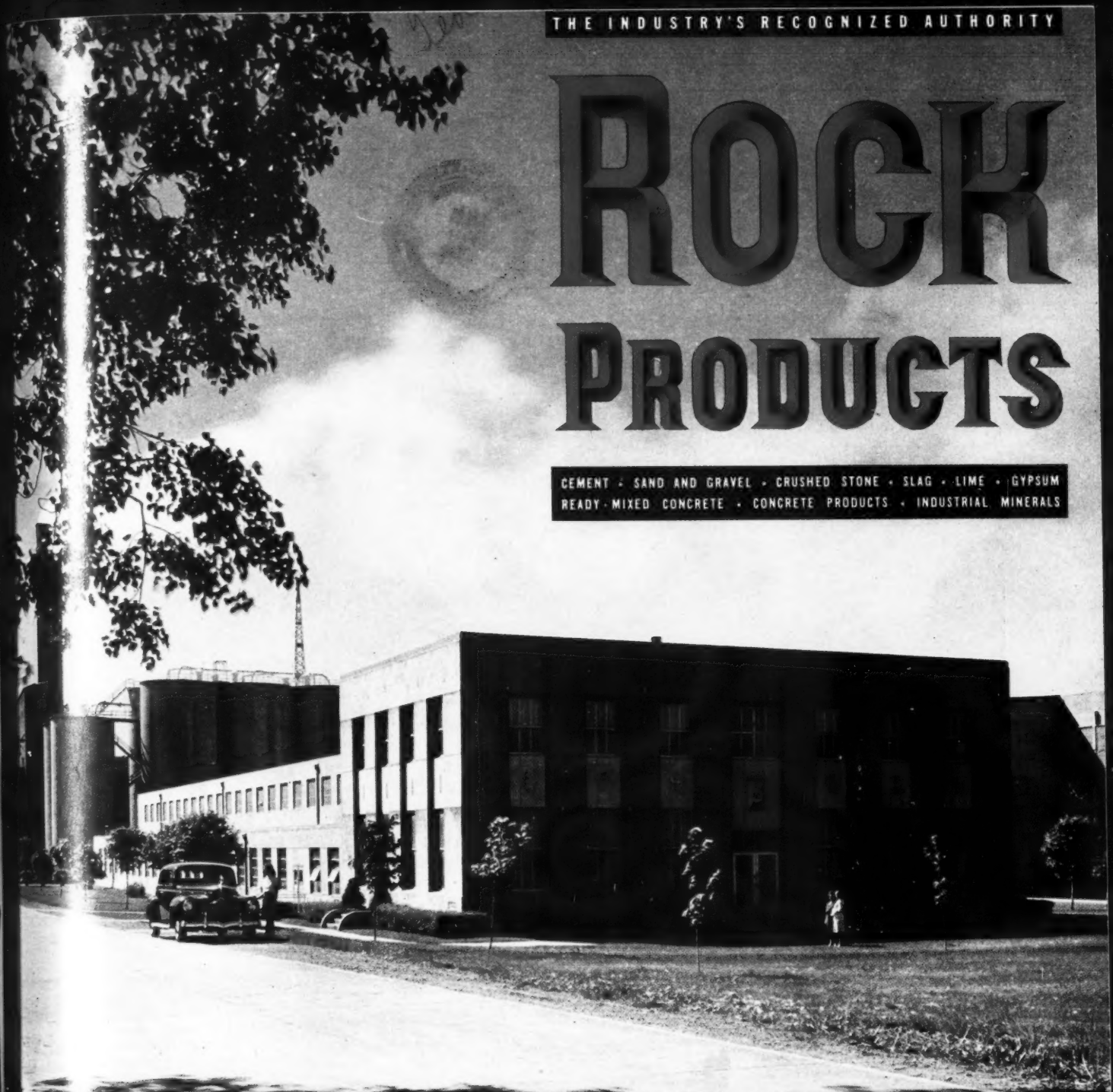
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

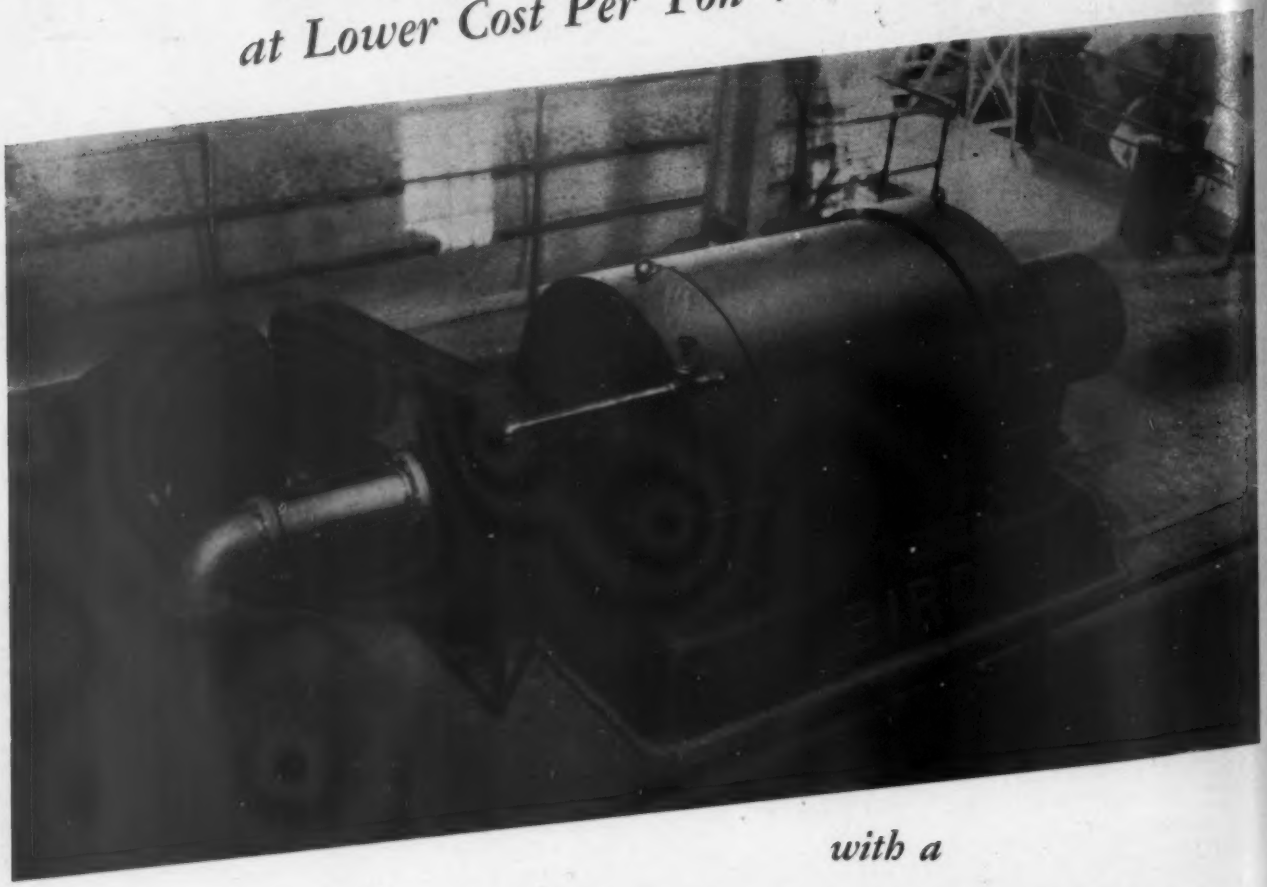
CEMENT · SAND AND GRAVEL · CRUSHED STONE · SLAG · LIME · GYPSUM
READY-MIXED CONCRETE · CONCRETE PRODUCTS · INDUSTRIAL MINERALS



HUDSON, NEW YORK, PLANT
Universal Atlas Cement Co.

ANNUAL CEMENT ISSUE · AUGUST 1946

You Can Make BETTER CEMENT
and More of It Per Day
at Lower Cost Per Ton . . .



with a

BIRD CLASSIFIER

CLOSING YOUR GRINDING CIRCUIT

The BIRD takes the slurry at mill consistency and with the clay already in it if you wish.

It separates the fines and they're in just the quality and consistency you want for burning a better cement.

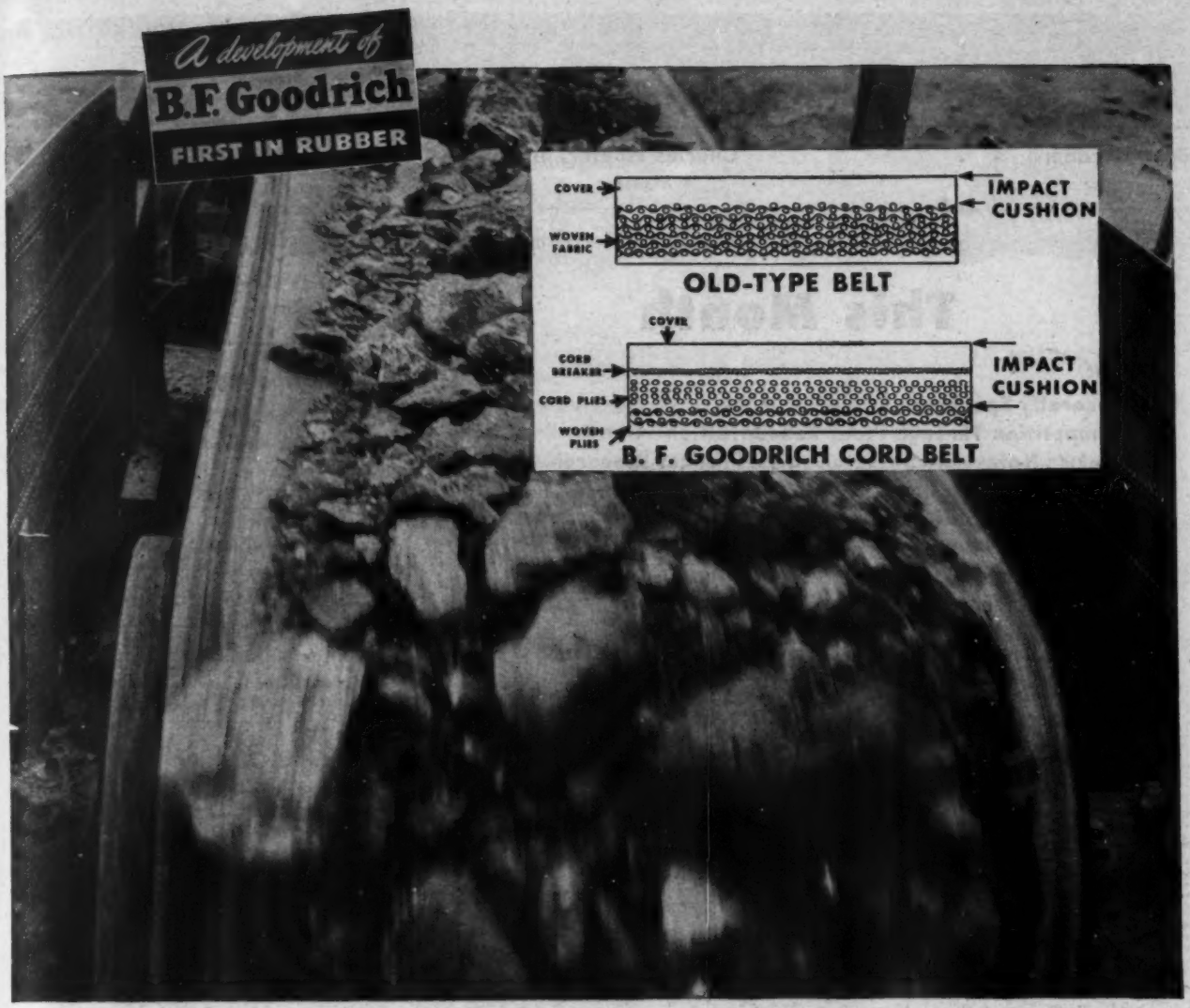
It returns the oversize so clean that milling efficiency and capacity are substantially increased.

It costs so little to operate and maintain that overall grinding cost is reduced. One Bird Classifier has handled nearly half a million tons of rock without a single shutdown for maintenance.

We have just prepared a new Bulletin that will give you a better idea of the Bird Classifier and what it can do for you. May we mail you a copy?

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

BUILDERS OF BIRD CONTINUOUS CENTRIFUGAL FILTERS



B. F. Goodrich cord conveyor belt reduces handling costs, lowers maintenance expense, gives long life with minimum upkeep

Developed for heavy-duty materials handling service

MANY B. F. Goodrich cord conveyor belts have carried 6, 7, 10 million tons of material without appreciable signs of wear. One mine operator in Minnesota reports savings of $30,000 per year by the elimination of transfer points, plus saving all the time and cost formerly wasted in shutdowns and repairs. The cord belt's long life and superior performance result from shock absorbing action that is built into the carcass of the belt.

In this new construction, each cord in each ply is completely surrounded by rubber. Then a layer of parallel cords called a transverse breaker, also embedded in rubber, is laid *across* the belt — floating in rubber above the carcass and covered at the surface by another rubber layer.

Because each cord is embedded in rubber, the impact cushion, as shown in the diagram, is nearly 3 times thicker than in conventional belt construction — impact resistance is nine times as great. The transverse cord breaker absorbs the impact over a greater area and increases adhesion of cover to carcass by at least 50%.

Your service requirements may not call for a heavy duty belt like the cord belt. So remember that there is a B. F. Goodrich belt for *every* kind of service. Be sure to specify B. F. Goodrich. Call your B. F. Goodrich distributor for *all* conveyor belt needs. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F.Goodrich

RUBBER *and* SYNTHETIC *products*

ROCK PRODUCTS

VOL. 49, NO. 8

AUGUST, 1946

This Month

ROCK PRODUCTS is published monthly by MACLEAN-HUNTER Publishing Corporation, 309 West Jackson Blvd., Chicago 6, Illinois; Horace T. Hunter, President; John R. Thompson, Vice President; J. L. Frazier, Secretary. Entered as second-class matter, Jan. 30, 1936, at the Chicago, Ill., post office under the act of Mar. 3, 1879.

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To Subscribers — Date on wrapper indicates issue with which your subscription expires...In writing to have address changed, give old as well as new address.

A complete package!

NEW LORAIN TL-20 COMES TO YOUR JOB READY FOR WORK

Choose your mounting and type of boom equipment and that does it! The TL-20, as a standard unit, comes to you with all the so-called "extras" built in, plus a lot more premium features never before offered by a machine in the ½-yd. class.

Check these features, then inspect a TL-20 at your nearest Thew-Lorain distributor. You'll find it a "complete package" full of many profitable surprises.

The Thew Shovel Company
LORAIN, OHIO

FIRST WITH THE FEATURES THAT COUNT

No Extras—all essential and desirable accessories (starter, generator, lights, etc.) are built as standard into every unit.

Unit Assembly—each major component (clutch shaft, engine, etc.) can be removed and interchanged as a complete unit.

2-Speed Crawler—2 speeds, standard equipment, available in both directions. Chain driven. Oil enclosed propelling mechanism.

Rubber-Tire Mountings—choice of nine mountings (Moto-Crane and Self-Propelled types) on 4 or 6 wheel units with or without front wheel drive.

5 Interchangeable Booms—available with interchangeable boom assemblies for shovel, crane, dragline, clamshell and hoe operation.

One-Piece Bed—turntable bed consists of a one-piece, all-welded, all-steel unit, which revolves on four Hook Rollers.

The NEW Lorain TL-20

You'll find the NORTHWESTS in the TOUGH DIGGING

All across the country—
Maine to California—

Built to take the punishment of rock digging, they bring you advantages that mean output in the toughest going.

The Northwest Dual Independent Crowd utilizes force other shovels waste. The Northwest Welded Boom with its rugged sticks tied together at the inner-end provides a front-end that will stand up to the toughest digging you'd ever put a shovel in. The Cushion Clutch eliminates the effects of stock overload to parts under power when the dipper hits an immovable rock Uniform Pressure Swing Clutches take the grabs and jerks out of swinging, and last but not least the "Feather-Touch" Clutch Control assures easy operation, yet retains the feel of the load.

Mark it up for those future jobs you are going to bid on — it's a money maker.

NORTHWEST ENGINEERING COMPANY

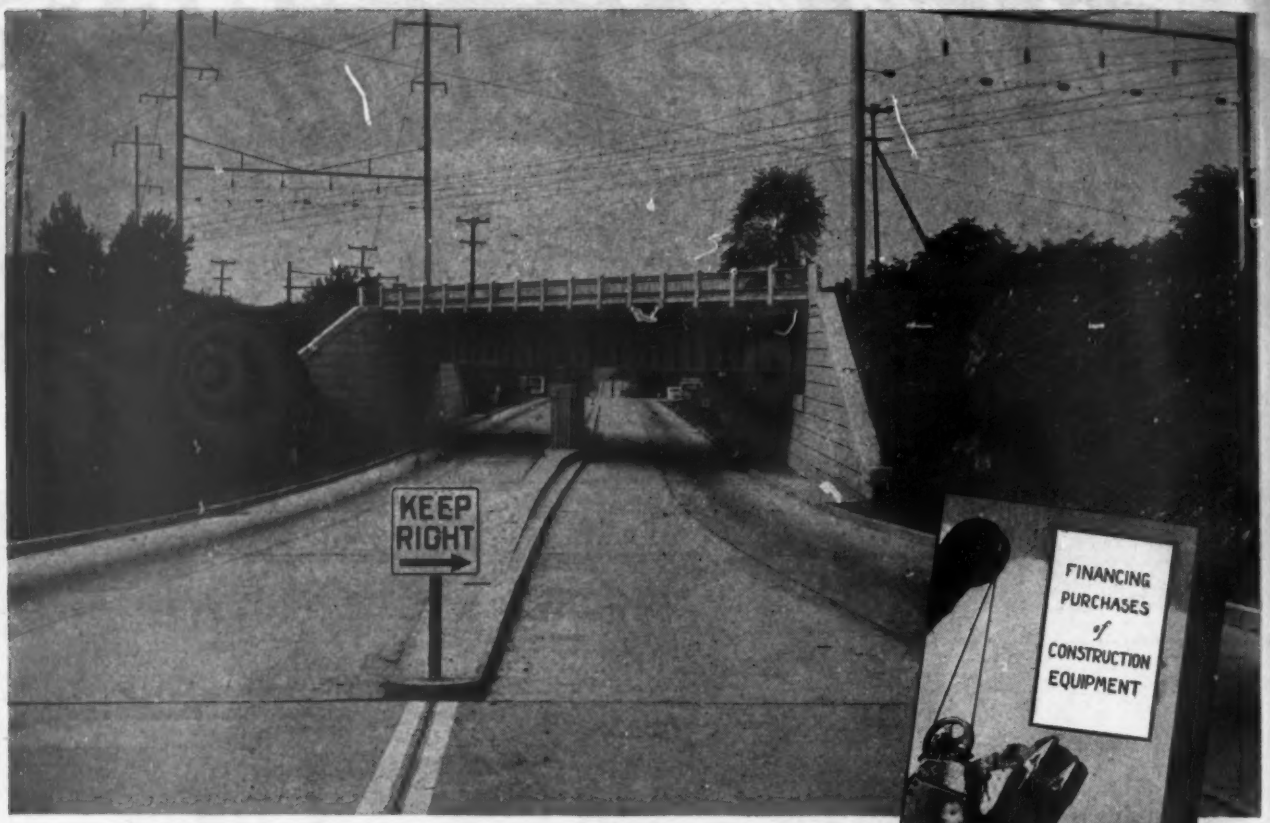
1820 Steger Building — 28 E. Jackson Boulevard — Chicago 4, Illinois

INDEPENDENT CROWD plus AUTOMATIC CROWD
FOR GREATER DIGGING POWER
The DUAL CROWD

If you have a REAL ROCK SHOVEL you never have to worry about output in dirt!

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS



A SAFE ROAD TO FOLLOW

Contractors: Instead of tying up valuable working capital in purchases of Construction Equipment, LET C.I.T. FURNISH THE FUNDS.

You select the equipment needed . . . take delivery . . . we pay the bill . . . let the machinery pay its own way out of earning capacity . . . repay the obligation over extended periods.

Play safe! Conserve operating funds for pay rolls, supplies, materials, tax payments. C.I.T. will finance your equipment purchases at LOW COST; terms to suit the needs of your business.

Send for free copy of new booklet on "Financing Purchases of Construction Equipment." It explains our LOW COST plan; tells how contractors arrange C. I. T. financing.

Any of these offices are at your service.

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NEW YORK, N. Y.

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SAN FRANCISCO, CALIF.

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The Mark of LEADERSHIP
C.I.T. CORPORATION
INDUSTRIAL FINANCING

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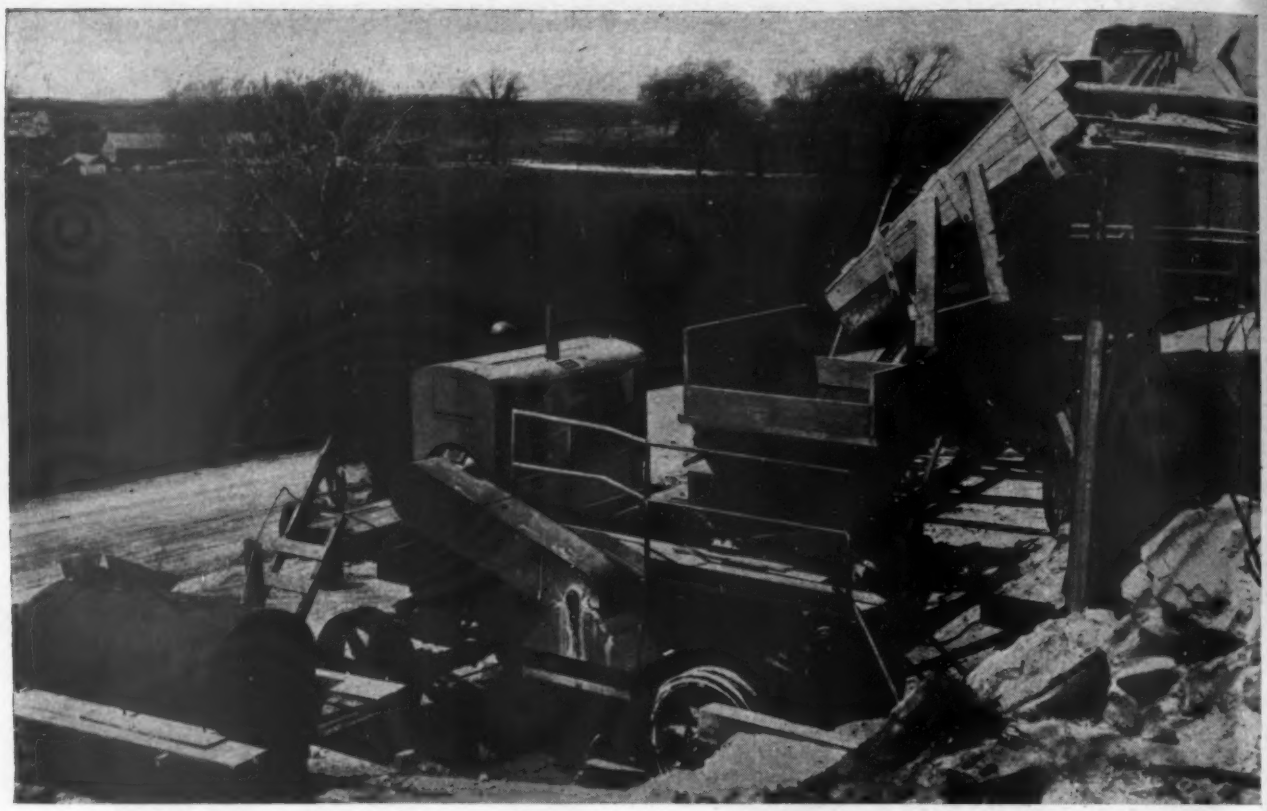
AFFILIATED WITH COMMERCIAL INVESTMENT TRUST INCORPORATED


TRAYLOR
CEMENT EQUIPMENT
During more than twenty-five years Traylor has helped equip many cement plants in this and foreign countries.
This experience, plus a thorough knowledge of what is required for cement manufacture, keeps Traylor engineers up to date in machinery design. They are constantly making improvements in cement machinery to meet modern demands.
Many facilities created by us for the cement industry are available for increased production and expansion.
Write us if our engineers can help you in any way.
TRAYLOR
ENGINEERING & MANUFACTURING CO.
MAIN OFFICE AND WORKS — ALLENTOWN, PENNA., U.S.A.



Mobile rock-crushing plant, easily moved from one location to another, powered by MURPHY DIESEL Model ME-66, 6 x 6½", 6-cyl., full Diesel engine.

Powered by Murphy Diesel..*It is Dependable!*

WHETHER it's a rock crushing plant or one of many other types of construction equipment, if it's powered by MURPHY DIESEL, it has DEPENDABLE, low-cost power. More and more manufacturers and users of heavy-duty equipment are accepting this fact because MURPHY DIESEL DEPENDABILITY continues to be proved in performance . . , not only on rock crushers, but also at sand and gravel plants, on excavating and loading machines, hoists, pumps, locomotives, logging, lumbering and mining equipment, work boats . . . for heavy electrical loads, too . . . and for many other heavy-duty applications.

These rugged, reliable engines are compact, relatively light in weight, strong in reserve power. Simple in construction, simple to operate, easy to start in any weather, their operating and maintenance costs are low. On new or re-built equipment, specify MURPHY DIESEL . . . it's DEPENDABLE POWER! Write for bulletin.

FIELD-PROVEN *Power*..

More Power MURPHY DIESEL More Profit

119

MURPHY DIESEL COMPANY

Engines from 90 to 215 H.P. Generator Sets from 60 to 115 K.W.

5315 W. BURNHAM STREET • • • • • MILWAUKEE 14, WISCONSIN

The Way Over the Mountain

Another first for the "rubber railroad"

BACK in 1941, the contractors of the gigantic Anderson Ranch Reclamation Dam job in Idaho were confronted with a weighty problem. They had to transport 8,000,000 tons of impervious clay across two miles of mountain range, then down to the bottom of a precipitous canyon, 1,000 feet deep.

The descent was far too steep for any wheel- or rail-borne carrier to negotiate. So, the engineers called in the G.T.M. — Goodyear Technical Man. He recommended a Goodyear "rubber railroad" — a system of nine Goodyear conveyor belts snaking around and down the mountain from pit to dam; a two-mile roller-coaster flight descending 1,193 feet over grades as steep as 32% in some sections.

This Goodyear rubber railroad has now been in service nearly three years; carried 1,280 tons *every working hour!* And today the 30,000 feet of Goodyear conveyor belting still looks as good as new!

A full-color documentary sound film, "The Way Over the Mountain," is now ready for showing to all groups interested in lowest-cost-per-ton transport of bulk materials. To see it, just send a request to the G.T.M., Goodyear, Akron 16, Ohio or Los Angeles 54, California.

GOODYEAR

THE GREATEST NAME IN RUBBER

9 Ways to Save

With Allis-Chalmers Type "R" Crusher

1 **RECESSED SPIDER CAP** reduces wear . . . adds to life of crusher because *feed itself* takes wear when it fills recessed cap. Uniform distribution of feed under all operating conditions.

2 **LARGE, AMPLE FEED OPENING** will take unregulated feed. Eliminates need for feeders . . . *saves* installation expense and labor . . . *simplifies* your crushing plant layout.

3 **ONE PIECE MANGANESE** steel concave ring can be easily and *inexpensively* replaced. Ring is held in place by a unique self-locking device . . . can't work loose. Does not require zincing.

4 **CRUSHING CHAMBER** is scientifically designed to give you continuous *high capacity* of desired product size. You get a more uniform, cubical product, closely graded to your requirements.

5 **FLOOD LUBRICATION** of moving parts gives you trouble-free service . . . reduces wear and maintenance. Oil is *cooled and filtered* as it circulates. Has oil pressure safety switch.

6 **DUST PROTECTION** — A large, effective dust seal protects all internal working parts . . . *reduces wear* by keeping grit and dirt out of eccentric bearing at all times.

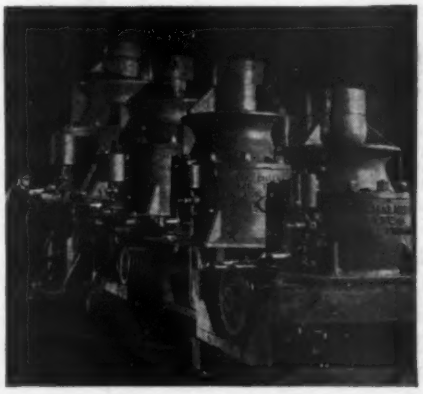
7 **EXCLUSIVE "SPEED-SET" CONTROL,** *instantly* regulates product to exacting size requirements . . . with the turn of a hand crank. Allows quick adjustment for wear on mantle and concave ring.

8 **AUTOMATIC RELIEF VALVE** is a safeguard that lowers crusher head, allows tramp iron and foreign materials to pass. Opens at predetermined pressure. *Protects* crusher from damage.

9 **LARGE HYDRAULIC JACK** greatly reduces expensive outage time by *quickly* restoring crusher to duty after power or other interruptions. Saves man-hours as well as down-time.

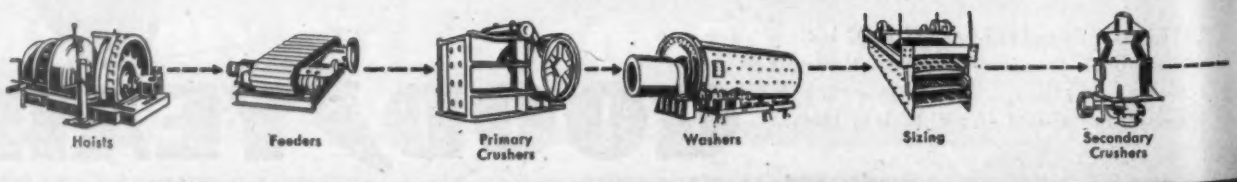
YES, THESE ARE NINE IMPORTANT CONSTRUCTION FEATURES that make the Type "R" Crusher a real money saver. And there are other reasons, too, why operators prefer the Type "R". Fast, easy clearing, for example. In case of power interruption the crushing chamber can be emptied in a *matter of minutes.* No laborious digging out the crusher by hand . . . the whole crushing head lowers, unloading the chamber. Crusher is quickly restored to operation with exclusive Allis-Chalmers *"Speed Set"* control, by simply turning a hand crank.

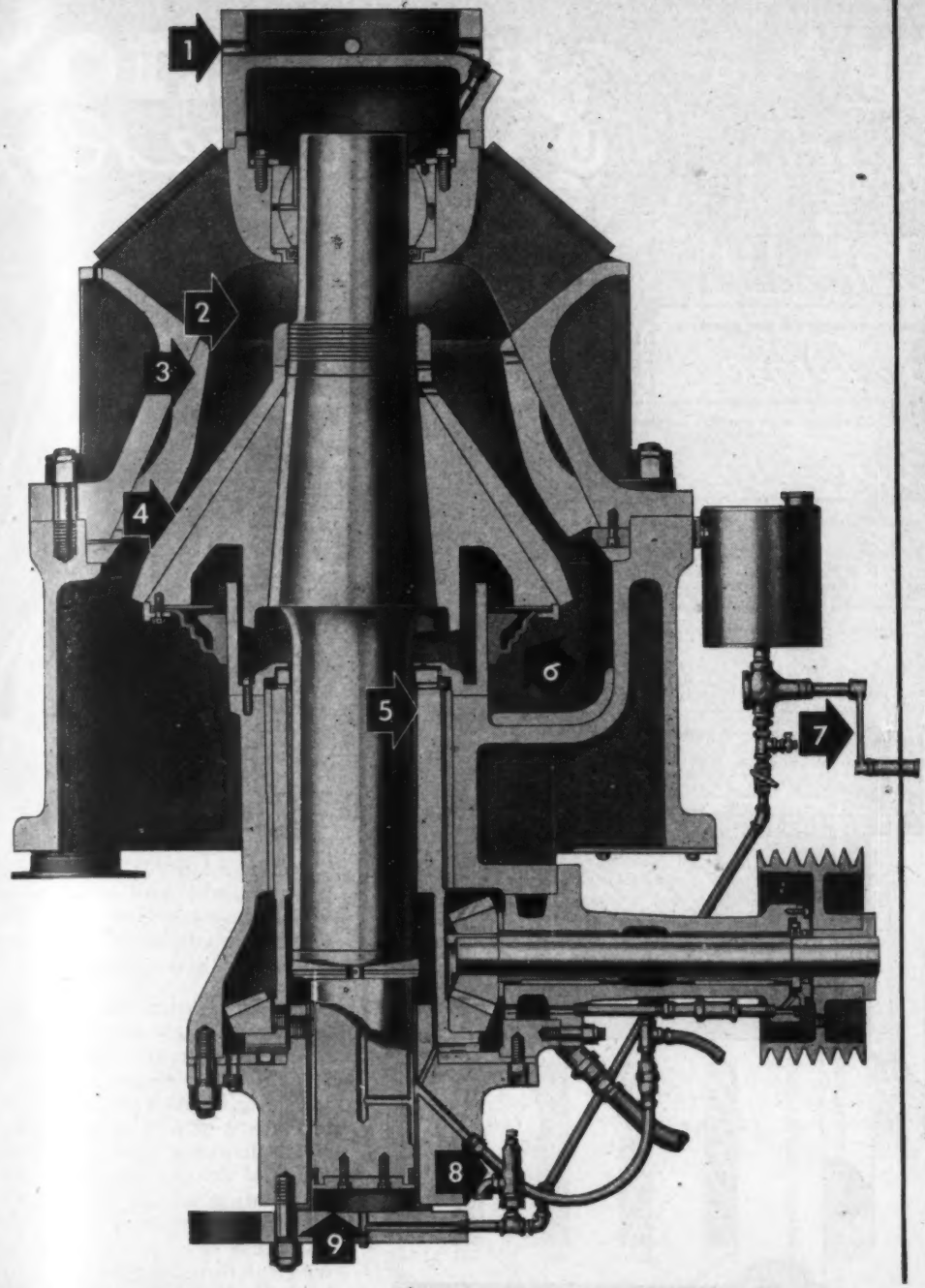
Plan to put this cost-cutting crusher to work for you — it will bring you better crushing at a lower cost per ton. Contact your nearby A-C office today for complete details. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2061



High performance Type "R" Reduction Crushers are available in four sizes, with 3,5,6, and 8 inch receiving openings. Bulletin B6006.

ALLIS CHALMERS





IF YOUR PROBLEM IS PRIMARY CRUSHING—

Allis-Chalmers builds the Superior McCully, a gyratory type primary crusher larger than the Type "R".

Built to chomp up the largest feed sizes of tough rock and ore, these machines combine features of design and heavy duty construction that give you both long crusher life and low operating costs.

Receiving openings up to 60 inches available in the Superior-McCully.

60% STRONGER SHAFT

In the Superior-McCully the eccentric is placed directly below the crushing head, a design feature that increases the strength of the shaft 60% over long shaft crushers . . . eliminates shaft deflection . . . increases capacity.

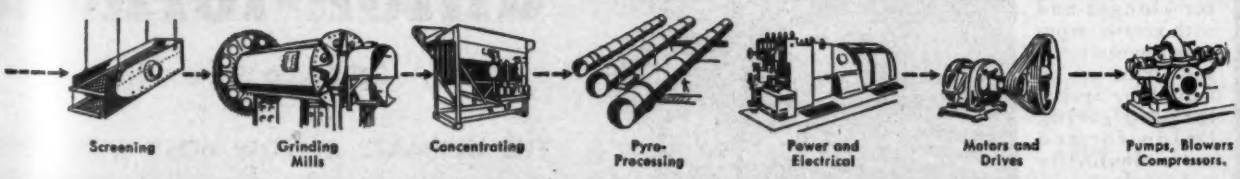
SECTIONAL MANTLES

The breaking head may be obtained with sectional mantles that permit replacement of parts taking the most wear. Breaking surfaces may be either smooth or ribbed . . . made of either manganese or chilled steel, to best fit the type of material handled.

World's largest manufacturer of rock and ore crushing machinery, Allis-Chalmers builds the *four basic types* of crushers . . . each in a wide range of sizes to meet *any* type of crushing problem.

This means you get exactly the *right* crusher for *your* job . . . which usually means better operating efficiency and lower crushing costs. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products

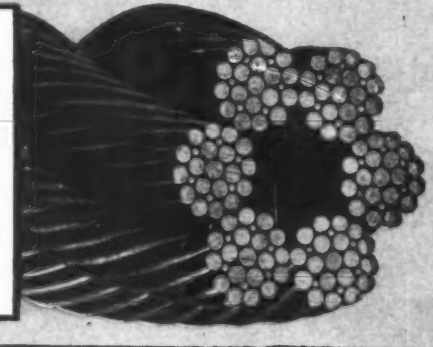


union is Wire Rope

"Steel Tendons" is a new book of photographs and descriptions which show you how Union Wire Rope is made, from the laboratory to the master reel.

Nine educational bulletins entitled "Rope Dope" are published at frequent intervals. They contain valuable information for the wire rope user on such subjects as: replacement of wire rope as to size, tread, diameter, type of construction and correct grades of steel; explanation of the lays of wire rope; types of wire ropes with complete specifications; factors which determine rope life; installation and abuses to be avoided; care of wire rope; abuses and their results and figuring the working load and actual stresses.

Union-formed wire rope is designed to do specific jobs better—longer and with greater economy. Internal stress and strain are removed by special forming giving Union-formed more flexibility and stamina.



union-formed

(preformed)

THE ULTIMATE IN LOW COST WIRE ROPE

is Made by Specialists Who Share Their Knowledge to Help Users Get Maximum Service

Ours is an organization of specialists devoting their whole time to the making of wire rope and to its application.

The latter is of importance to the user because the life and efficiency of the best wire rope is foreshortened if improperly applied.

To safeguard against this, distributors of Union Wire Rope are fully equipped with a thorough working knowledge of wire rope application and are capable of making sound recommendations.

To post users of Union Wire Rope on proper application and on many other factors involved in its use, a library of useful information is published. Sent gratis on request.

UNION WIRE ROPE CORPORATION
2156 Manchester Avenue — Kansas City 3, Missouri, U. S. A.

Send book or bulletin as checked.

Firm Name.....

By.....Title.....

Address.....

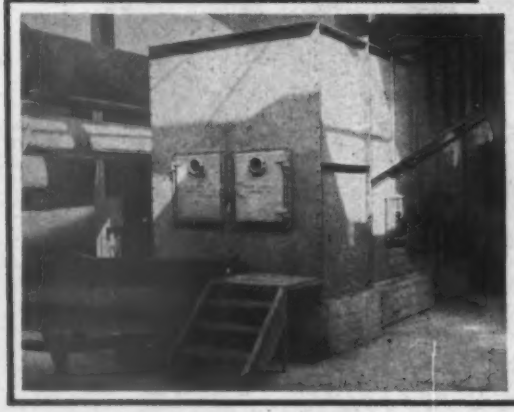
City.....Zone.....State.....

.....

State above use of wire rope contemplated.

- ☐ Steel Tendons
- ☐ Rope Dope No. 1
- ☐ Splicing Wire Rope
- ☐ Correct Handling of Wire Rope
- ☐ Socketing Wire Rope
- ☐ Wire Rope Lubrication

FULLER EQUIPMENT



To serve the industry better, and to meet the increased demand for its equipment, the Fuller Company recently concluded the purchase of the Hershey Machine and Foundry Company, Manheim, Pa. Secured in this purchase, is a modern manufacturing plant, comprising machine shops, a foundry, and laboratory, totaling about 300,000 square feet of floor space. This plant, together with a new plate shop erected and placed in operation in Catasauqua early this year, will enable us, better than ever before, to fulfill our obligations to the cement and chemical-process industries.

For 20 years, the name Fuller has stood for leadership in its field. Starting in 1926, with only the Fuller-Kinyon Conveying System, the Company has never ceased to work very closely with the cement industry.

The Company aim—to anticipate the needs of the industry, to design and build equipment to perform efficiently at low-operating cost, and to better working conditions. In pursuance of this policy, many improvements and refinements have been made to the Fuller-Kinyon System. Among the many other contributions offered the industry in recent years are the Fuller Rotary Compressor, the Fuller Air-Quenching Inclined-Grate Cooler and the Fuller Dry Pulverized-Material Cooler. Both of these coolers have met with marked success, having been accepted as outstanding developments in cement manufacture.

FULLER COMPANY

FULLER-KINYON, FULLER-FLUXO AND THE AIRVEYOR CONVEYING SYSTEMS . . . ROTARY FEEDERS AND DISCHARGE GATES . . . ROTARY AIR COMPRESSORS AND VACUUM PUMPS . . . AIR-QUENCHING INCLINED-GRATE COOLERS . . . DRY PULVERIZED-MATERIAL COOLER . . . AERATION UNITS . . . MATERIAL-LEVEL INDICATORS . . . MOTION SAFETY SWITCH . . . SLURRY VALVES . . . SAMPLERS

AND THE PLANTS THAT BUILD IT

MANHEIM, PA.
PLANT

CATASAUQUA, PA.
PLANT

G-44T

FULLER COMPANY

CATASAUQUA — PENNSYLVANIA

CHICAGO 3
120 So. LaSalle St.

WASHINGTON 5, D. C.
Colorado Bldg.

SAN FRANCISCO 4
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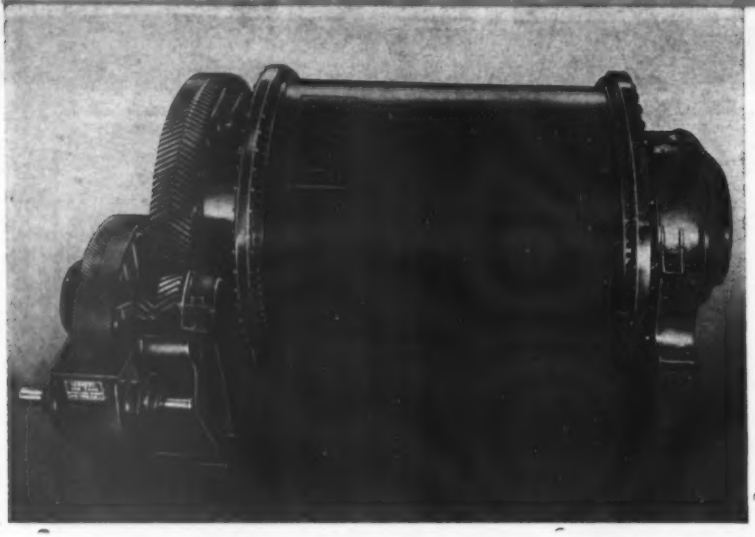
KENNEDY *gives you*



WE MANUFACTURE MACHINERY FOR A COMPLETE CEMENT PLANT . . .

KENNEDY
INTEGRAL GEAR DRIVEN TUBE MILL

The new KENNEDY Integral Gear Drive for Tube Mills can be used on Combination Ball Mills, Wet Grinding Tube Mills, Dry Grinding Tube Mills and Air Swept Tube Mills. It is impossible to mis-align these gears because the gear housing supports both the discharge end of the mill and the roller bearings carrying the gears. All bearing seats are machined in a jig at the factory to a tolerance of 3/1000 of an inch. The assembly of the gear is exactly the same as the reduction gears which everyone knows is the correct way of transmitting power. Thus we save approximately 10% in power over other best well-known types of tube mill gear drives, which means that one can obtain 10% greater production from a given size Kennedy tube or ball mill with a given size motor.

KENNEDY ROTARY KILN
10' x 9' x 250'

Mounted on 4 riding rings. These kilns can be built in any diameter or length desired. We are prepared to furnish complete cement plants and mining plants.

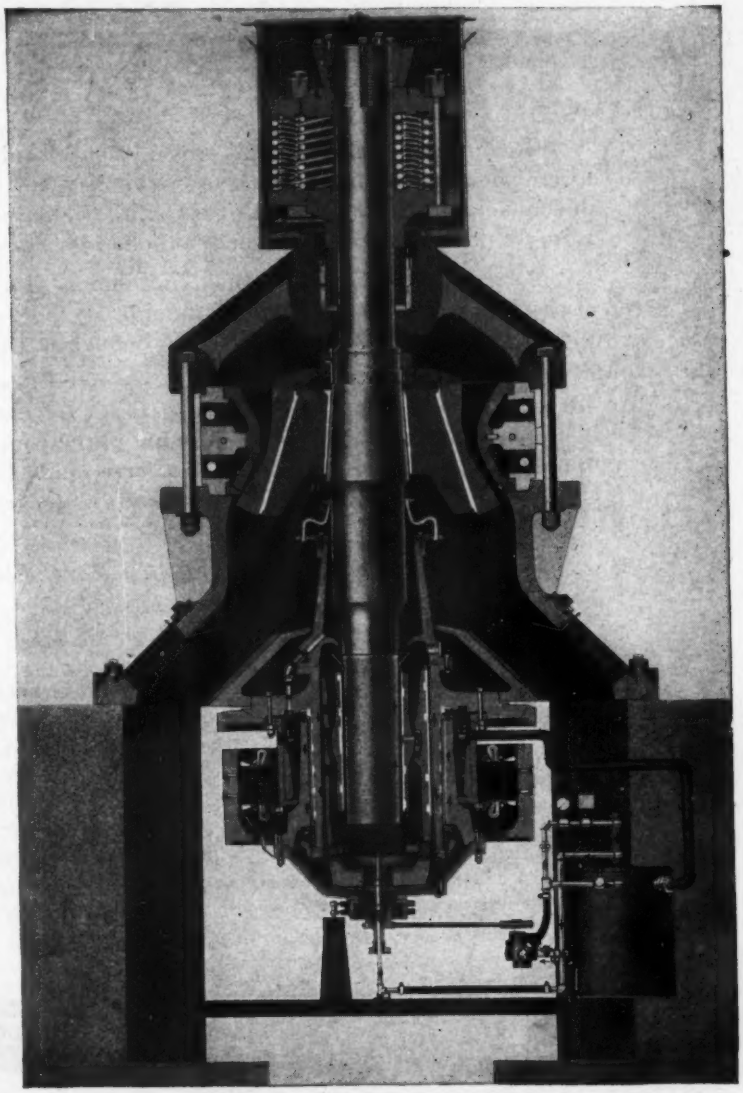
KENNEDY-VAN SAUN MFG. & ENG. CORPORATION

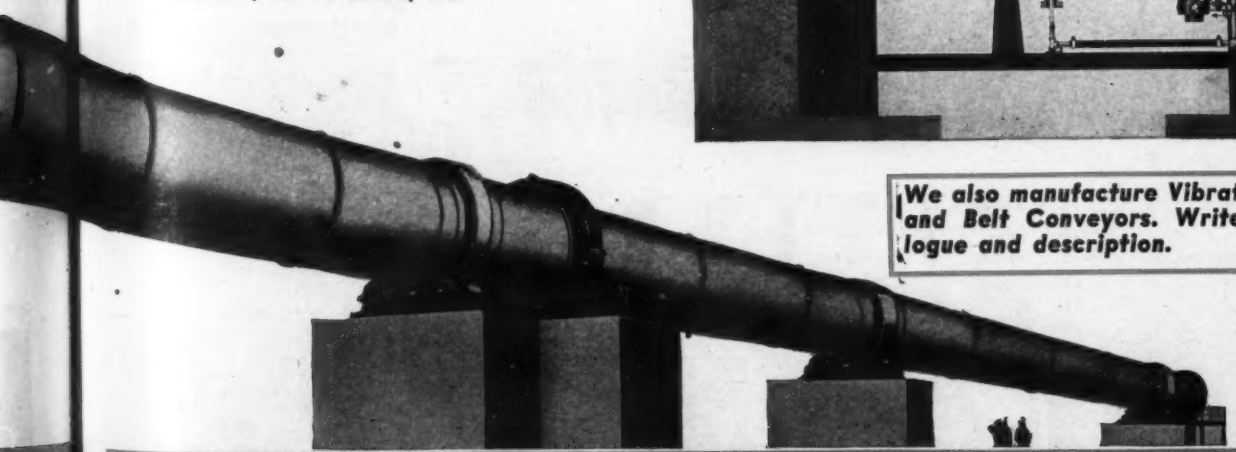
Efficient, Reliable Performance!

A #49½ KENNEDY BALL BEARING GEARLESS CRUSHER

with a Synchronous Motor built in its pulley. This machine shows **80% saving in the cost of maintenance** and a saving of **50% in power** over geared crushers. It has produced 156 tons per hour when set to 7/16" between the head and concaves at the bottom.

Write for information on KENNEDY Ball Bearing Gearless Standard and Secondary Crushers, Jaw Crushers, etc.





We also manufacture Vibrating Screens and Belt Conveyors. Write for Catalogue and description.

2 PARK AVENUE • NEW YORK 16, N. Y. FACTORY: DANVILLE, PA.

buell MEANS FREEDOM FROM

—plus Increased Production and Added Material Savings

Recent and exacting check-ups on Buell Equipment performance in America's foremost cement plants disclose convincing evidence that many important producers achieve unmatched recovery, in the collection of dust from kilns . . . without a single production slow-up or manhour loss due to equipment repair.

In numerous instances, Buell Equipment has withstood *years of gruelling production operation* while still maintaining its high overall collection, and without the slightest need of equipment repair. Such is Buell's record of accomplishment.

As the nationally vital cement industry gears itself to meet constantly increasing user demand in every area, Buell's six exclusive design features—listed below—will continue to make possible the unparalleled economy and dependable, long-lasting operating efficiency that have made Buell Equipment the outstanding choice of so many leading cement plant executives and engineers.

Six Exclusive Buell Features

1. The "Shave-Off" . . . The patented van Tongeren principle, exclusive with Buell. Utilizes the "double eddy" current, establishing a highly efficient collection force.

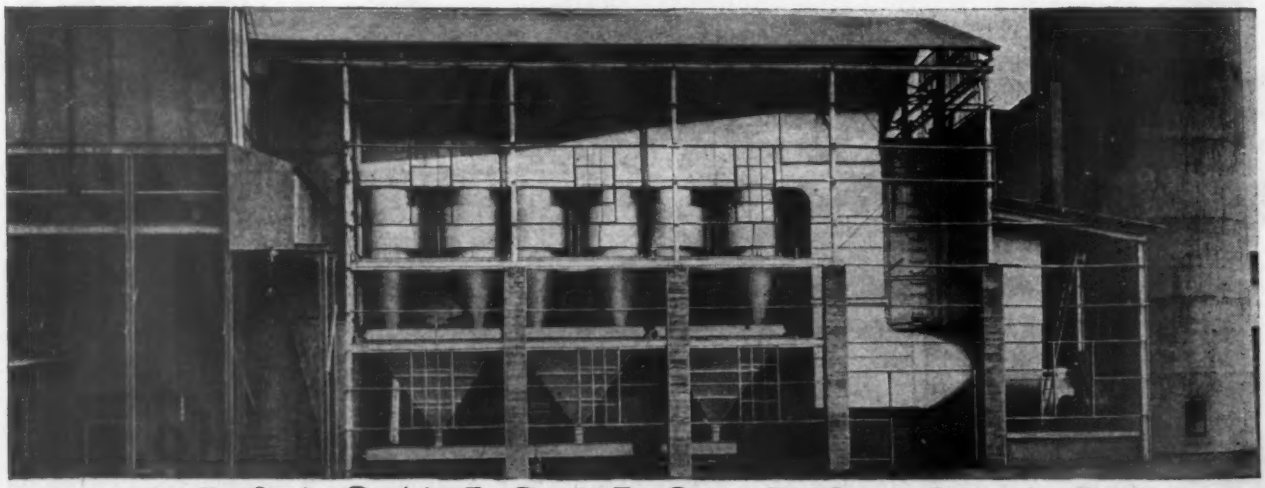
2. Large Diameters . . . Permit use of extra thick metal. Afford large dust outlets, prevent clogging. Reduce abrasion.

3. Extra-Sturdy Construction . . . Rolled and welded, one piece construction; hoppers braced with 3" channels to withstand vibration.

4. Correct Hopper Design . . . Plays a most important, often disregarded, part in dust collection efficiency. Dust disposal facility must be anticipated in the initial overall design.

5. Split-Duct Manifolding . . . A prime factor in efficient distribution of the dust load. Buell's manifolding method has flexibility, discharging gases from any side or end.

6. Inner Welds Ground Smooth . . . Proper finishing of inner welds effects operating efficiency, reduces erosion, ensures longer life.



DESIGNED TO DO A JOB

COSTLY REPAIRS—FOR YEARS!

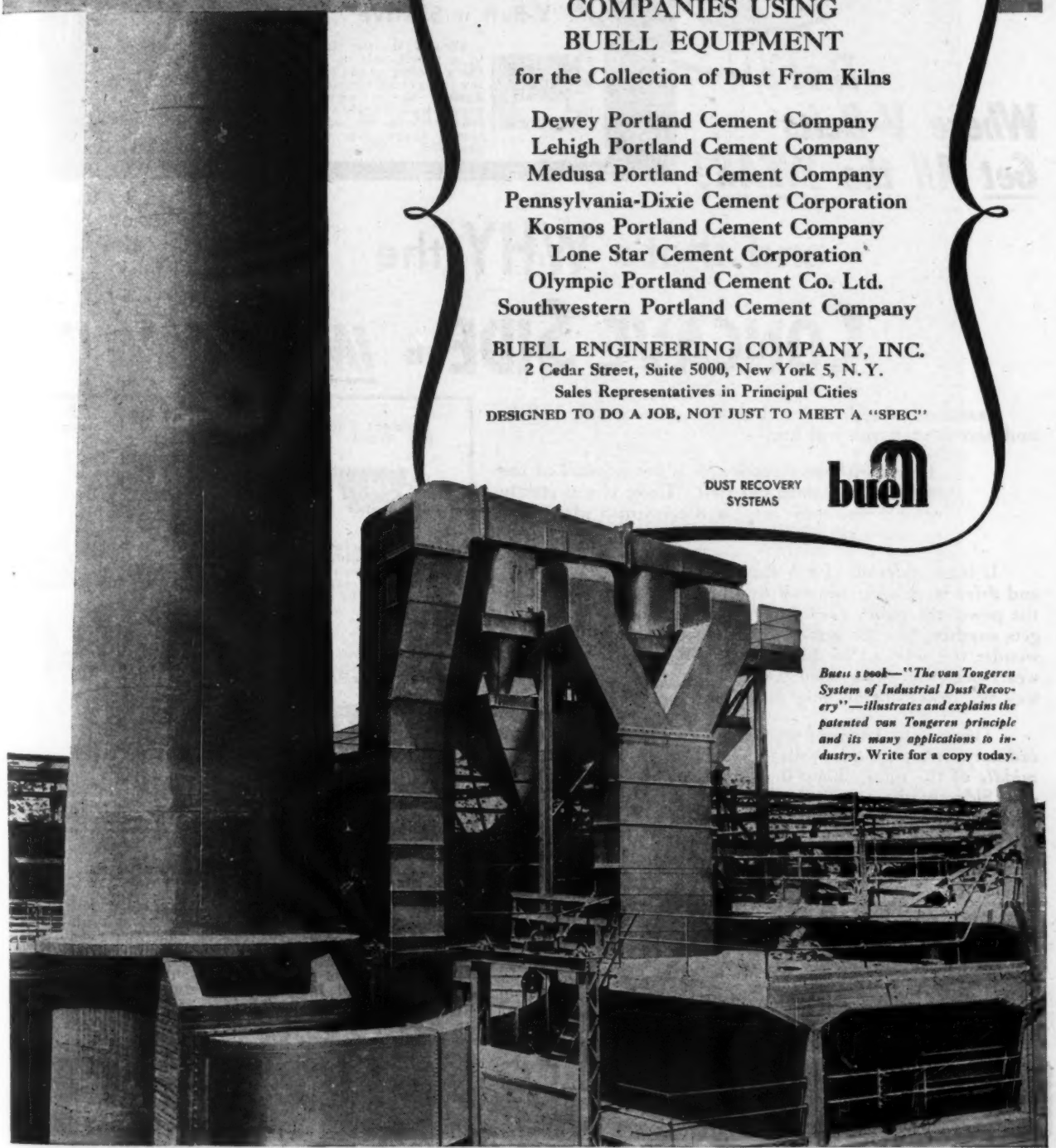
Following is a partial list of
NATIONALLY KNOWN CEMENT COMPANIES USING BUELL EQUIPMENT
for the Collection of Dust From Kilns

Dewey Portland Cement Company
Lehigh Portland Cement Company
Medusa Portland Cement Company
Pennsylvania-Dixie Cement Corporation
Kosmos Portland Cement Company
Lone Star Cement Corporation
Olympic Portland Cement Co. Ltd.
Southwestern Portland Cement Company

BUELL ENGINEERING COMPANY, INC.
2 Cedar Street, Suite 5000, New York 5, N.Y.
Sales Representatives in Principal Cities
DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

DUST RECOVERY SYSTEMS

buell



Buell's book—"The van Tongeren System of Industrial Dust Recovery"—illustrates and explains the patented van Tongeren principle and its many applications to industry. Write for a copy today.

NOT JUST TO MEET A "SPEC"

V-Belt in Sheave

Clearly, it's the sides of a V-Belt that do all the gripping on the pulley and get all the wear against the sheave-groove wall. That's why longer life for the sides means longer life for the belt!

That's Where V-Belts Get All the WEAR!

—and that's WHY the CONCAVE SIDE is *IMPORTANT!**

Examine a hundred—or a thousand—worn-out V-Belts and here is what you will find—

> *Almost without exception,* it is the sidewall of the belt that has worn out *first.* There is a perfectly natural reason for this—and every man who works around machinery knows it.

It is the *sidewall* of a V-Belt that has to *grip* the pulley and *drive* it. It's the sidewall that *transmits* to the pulley all the power the pulley ever receives. No other part of the belt gets anything like the *actual* wear the sidewall gets. Is it any wonder the sidewall of the *ordinary* V-Belt is the part that wears out first? And when you prolong the life of the sidewall you naturally prolong the life of the belt!

The simple diagrams on the right show clearly why the ordinary, *straight-sided* V-Belt gets *excessive* wear along the *middle* of the *sides.* They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight sided V-Belts can *possibly* give.

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

*More Important NOW Than Ever Before.

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important today than ever before!

468

THE GATES RUBBER COMPANY
DENVER, U. S. A.
World's Largest Makers of V-Belts

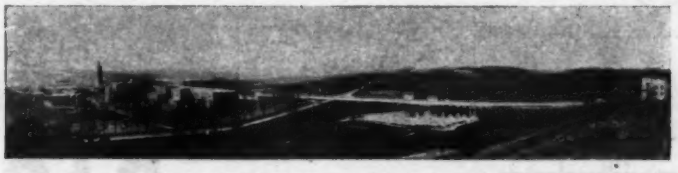
Gates

THE MARK OF SPECIALIZED RESEARCH

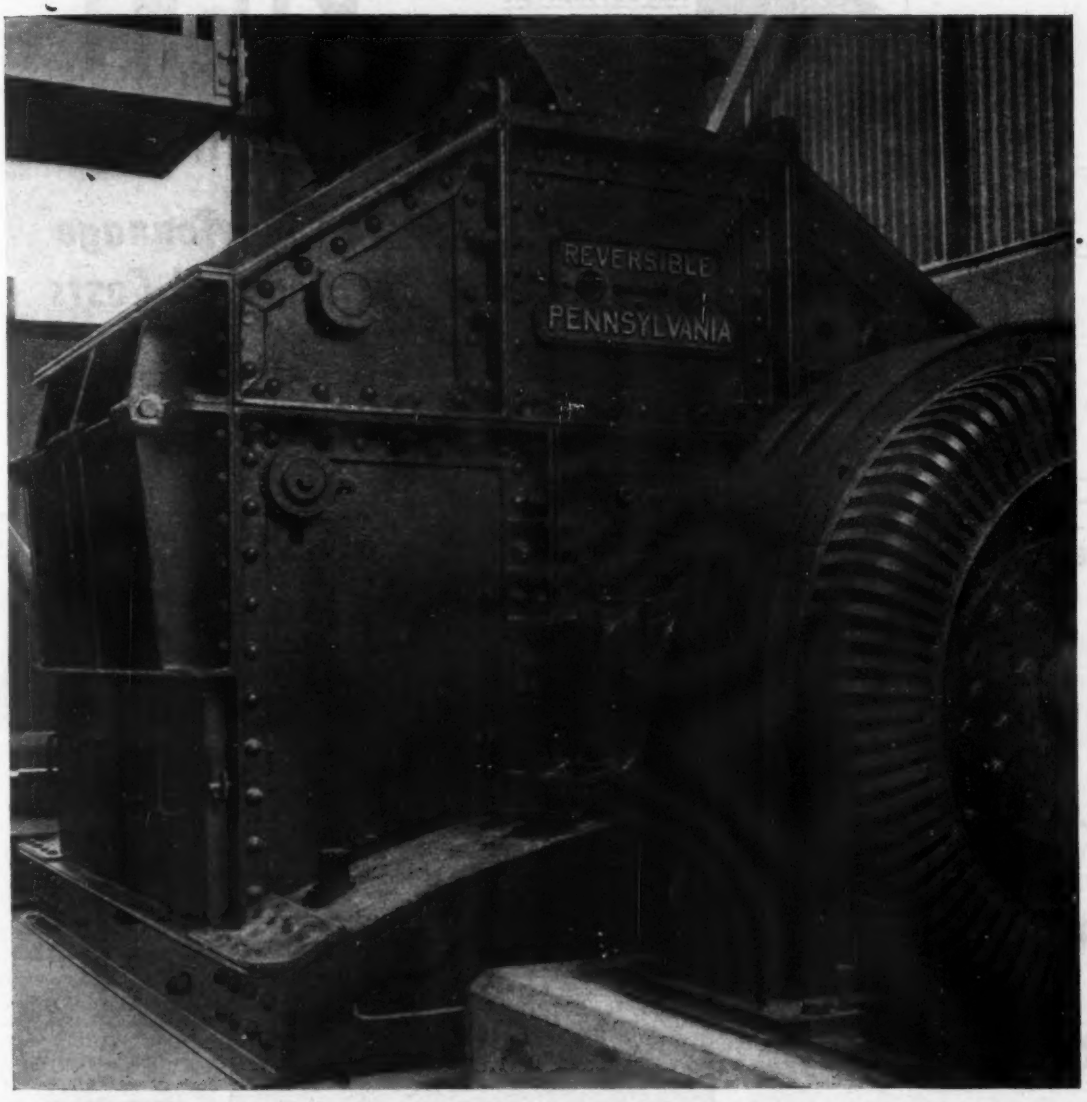
GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

"PENNSYLVANIA"



ONE OF THE WORLD'S GREAT CEMENT PLANTS



One of the major factors in the modernization program of a large American Cement Company, was the selection of the Primary and Secondary Crushers best adapted for the service, and the design of a Crusher Building for efficiently housing the Dumping, Feeding, Crushing and Conveying Equipment.

What was then the top size Pennsylvania REVERSIBLE Hammermill was selected and installed for preparing the output of the large Gyratory, for the next reduction stage, at the rate of 500 to 600 tons per hour.

During the past nine years, this 45-ton Pennsylvania REVERSIBLE has crushed millions of tons of some of the hardest and most abrasive Limestones employed in the Industry.

Our Engineers will gladly cooperate when you are tackling tough reduction problems.

General Offices: 17th Floor
Liberty Trust Bldg., Philadelphia 7

PENNSYLVANIA CRUSHER COMPANY

Associated with Fraser & Chalmers Engr. Wks., London

STEELBUILT CRUSHERS

Users write the best ads

W. T. BORDEN, Supt. of Maintenance of the Crystal Silica Company (California), writes:

"We have been using 'Caterpillar' track-type Tractors on our silica pit some 16 years . . . The main thing is the 'Caterpillar' Diesels are *dependable*. They keep going and keep the sand rolling in. That is what counts."

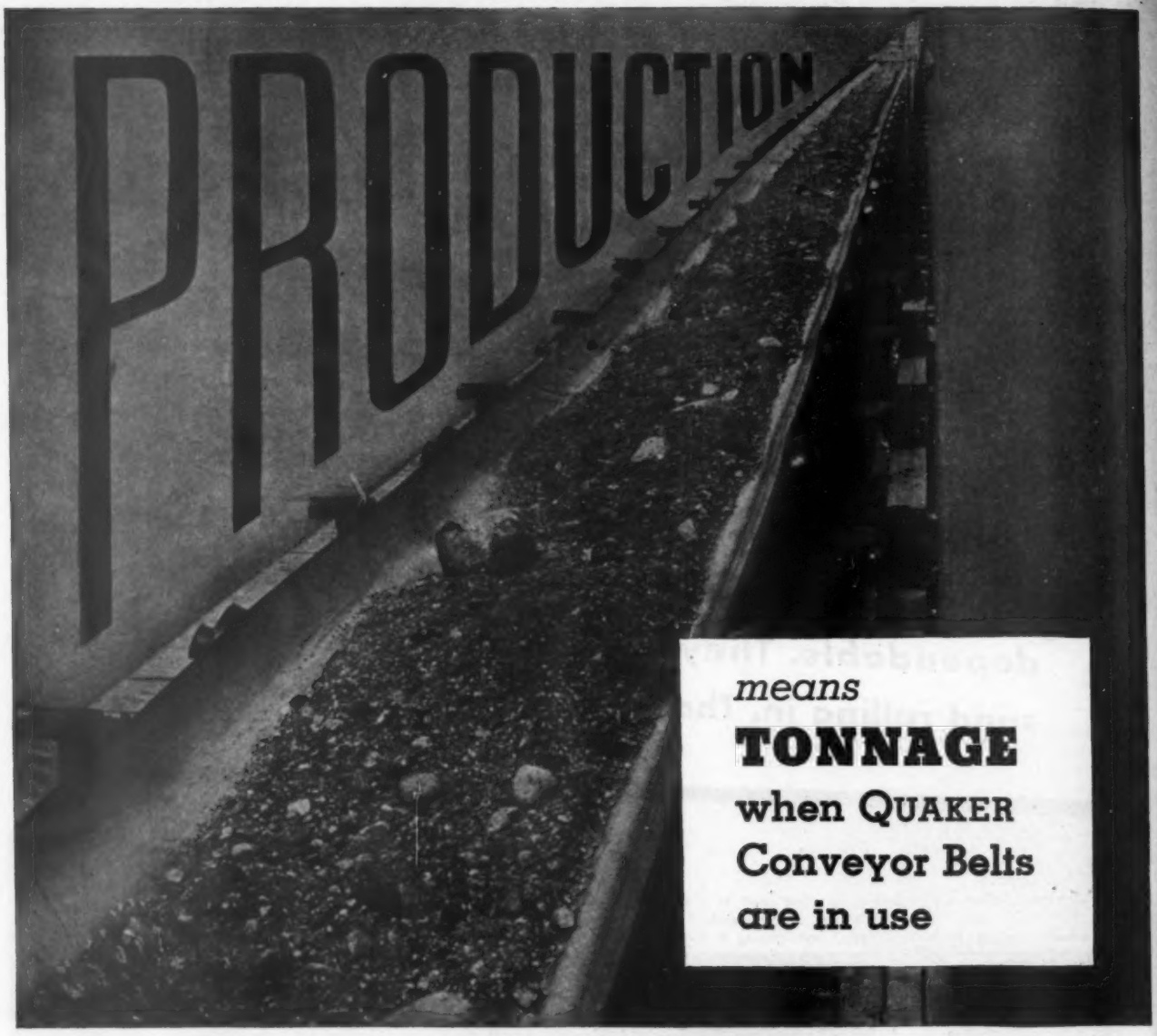
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

Crystal Silica Co. — Delivering silica sand to plant hopper with a "Caterpillar" D4. Owner also uses a "Caterpillar" D6 for removing overburden (up to 30 feet deep) and 'dozing it into worked-out pits.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT



QUAKER Conveyor Belts

Quarries depend on rubber conveyor belts to deliver big tonnage, and when you specify QUAKER and install these Quality Belts you can look forward to their handling thousands and thousands of tons of sand, gravel, crushed stone, cement and kindred products.

Quaker Belts are manufactured of American-made rubber for the covers and friction; carcass is of high grade duck and turned out under the supervision of highly trained technical, experienced belt workers.

Quaker manufactures a complete line of industrial Rubber Products that are so needed and used in and around quarries. Belting; Hose for air, water, suction, fire protection, steam, etc.; Rod and Sheet Packings; Gaskets; Pump Valves, etc.

It is good policy to keep on asking for Quaker . . . the name that stands for Quality Industrial Goods.

QUAKER RUBBER CORPORATION

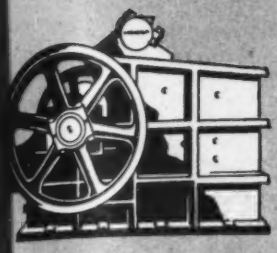
PHILADELPHIA 24, PA. • NEW YORK 7 • CLEVELAND 15 • CHICAGO 16 • HOUSTON 1

Western Territory

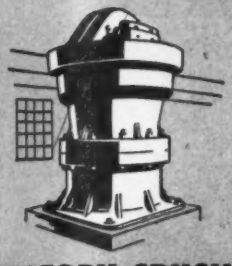
QUAKER PACIFIC RUBBER COMPANY • SAN FRANCISCO 5 • LOS ANGELES 21

NORDBERG MACHINERY

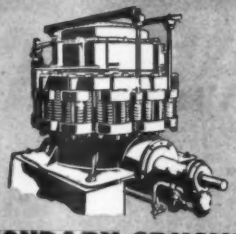
for CEMENT MILL OPERATIONS



JAW CRUSHERS



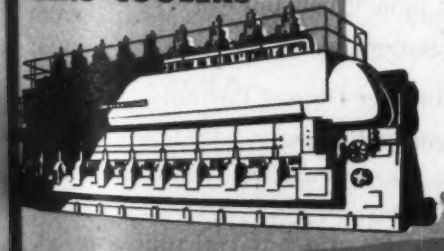
RATORY CRUSHERS



CONDARY CRUSHERS

GRINDING MILLS

KILNS-COOLERS



ESEL ENGINES

Greater Output—Lower Production Cost

Dependable Performance **are assured when Nordberg machinery is installed for cement plant operation. This line of machinery was developed to meet requirements of the cement industry and is backed by a long record of successful achievements in the heavy machinery field.**

CRUSHING

Jaw, Gyratory and Cone Crushers built by Nordberg cover the entire range of primary and secondary crushing. The many Symons Cones installed in cement mills for raw feed preparation and clinker crushing prove that this crusher will produce a uniformly fine mill feed at greater capacity, will increase mill output for the same power input and reduce mill maintenance expense.

GRINDING

Nordberg Rod, Tube, Ball and Compartment Mills are applicable to all wet and dry process cement plants.

CALCINING — COOLING

Rotary Kilns and Coolers are built for any capacity and for any service.

SIZING — FEEDING

Symons Vibrating Screens installed in conjunction with crushers, materially increase capacity and insure uniformly crushed materials. Vibrating Bar Grizzlies and Apron and Table Feeders are furnished for any service.

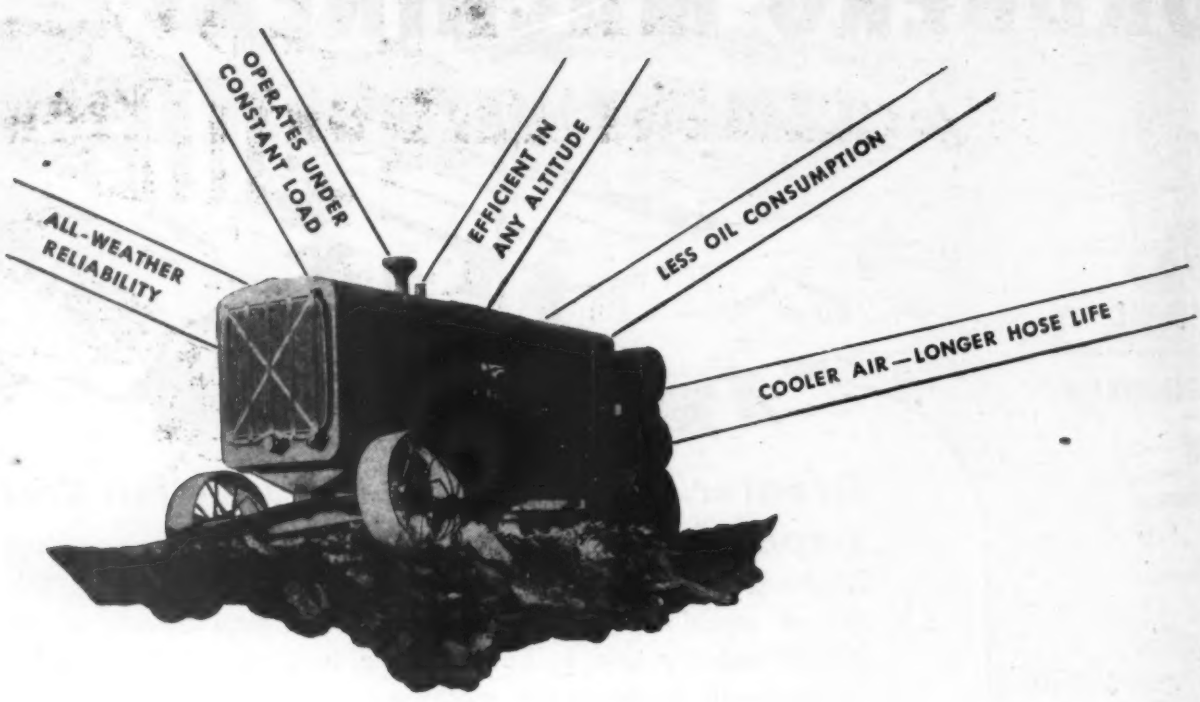
POWER GENERATION

Recent orders placed for Nordberg Diesel engines for power generation in cement plants include units of 1200 and 3600 horsepower. These Duafuel Diesels will burn either oil or natural gas.

When contemplating a new cement plant or modernization of an existing plant, investigate the merits of Nordberg machinery designed for your industry.

NORDBERG MFG. CO., Milwaukee 7, Wis.
NORDBERG PROCESS MCHY. DIVISION
60 East 42nd Street • New York City 17, N. Y.

NEW YORK • LOS ANGELES • WASHINGTON • LONDON • TORONTO • JOHANNESBURG



Add in these *Operating* Savings with a Gardner-Denver

All Water-Cooled Portable!

When you buy a Gardner-Denver All Water-Cooled Portable Compressor, you are buying long-term savings that can add up to a sizable sum on your jobs.

You are buying proved ability to do the work in any season—at any altitude—anywhere.

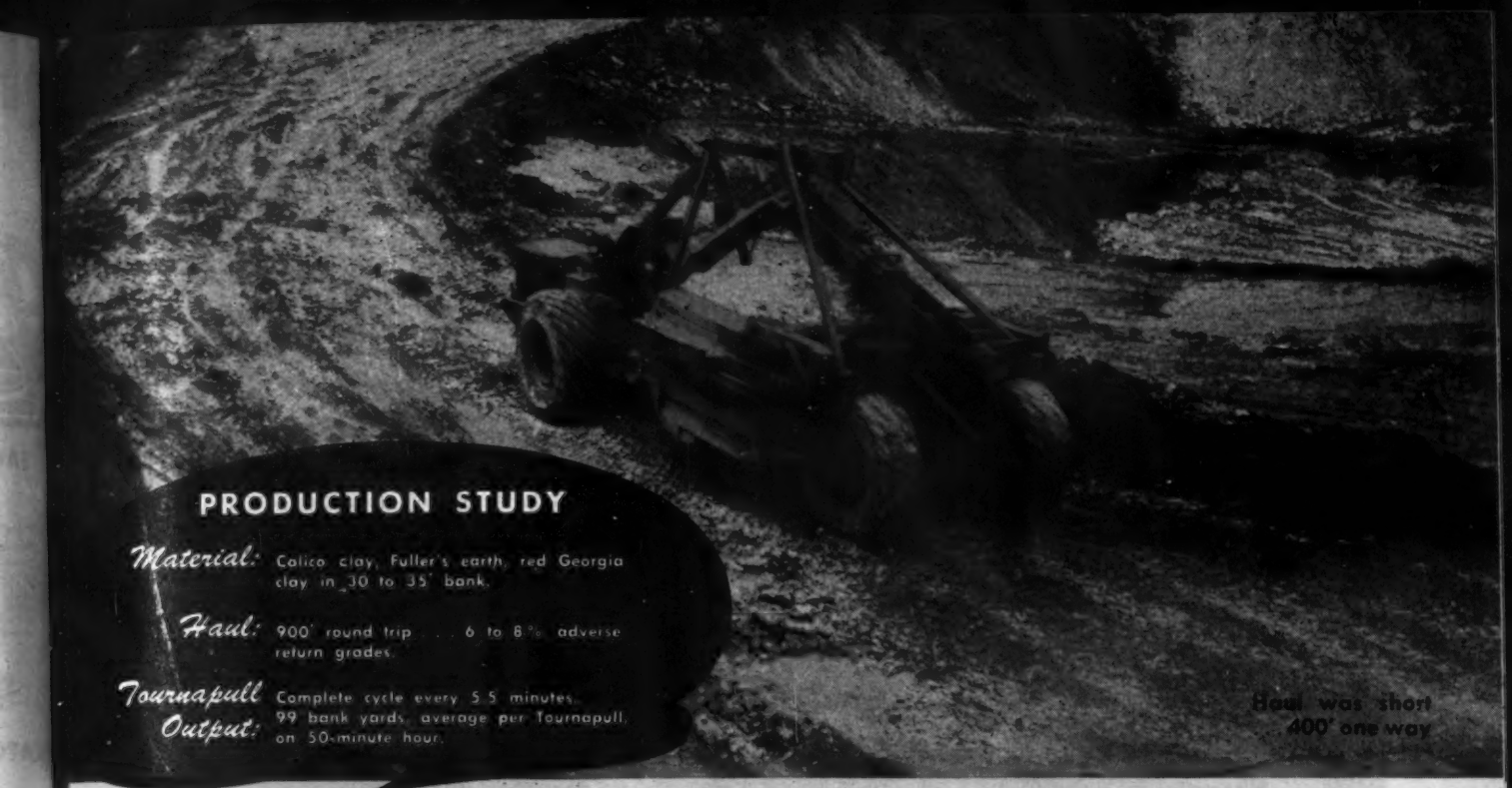
You are protecting yourself against costly delays and interruptions by assuring a constant and adequate supply of air at all times.

You are buying *cooler* air—and that means less lubricating oil consumption and longer hose life. In other words, you are getting the finest portable your money can buy—a portable with *completely* water-jacketed cylinders.

For complete information about Gardner-Denver Portables, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

Since 1859



2 TOURNAPULLS average 2000 yards per day stripping GEORGIA CHALK MINE

99 bank yards per hour was the production each Tournapull averaged on an 900' round-trip haul on the Georgia Clay and Coating Co. chalk mine at Macon, Georgia. Rain made footing slippery. Haul with load was 400', return 500' over 6 to 8% grade which slowed Tournapulls to 3rd gear.

Superintendent for A. L. Riley, stripping contractor, estimated two Tournapulls have averaged 2000 yards per day on the job with the average round trip 1300'.

Contractor Riley used a crawler-drawn scraper of same capacity on the same haul and in the same material . . . found it delivered 72 bank yards hourly, compared to each Tournapull's 99.

This LeTourneau Scraper set-up replaced 5 trucks and a shovel, proved so successful that Riley was given a new contract for an additional 60,000 cubic yards, bringing the total to 110,000.

Investigate similar savings in equipment cost, time, money and manpower possible on your job. Ask your LeTourneau Distributor for estimates on lowest-net-cost-per-yard Tournapull stripping for your pits.

PQ12

Tournapulls were snatch loaded in 85', 0.8 minutes. Depth of overburden ran from 30 to 35'. Dump was level; Tournapulls spread their loads in high or 3rd gear.

LETOURNEAU
PEORIA, ILLINOIS . STOCKTON, CALIFORNIA

JOB-PROVED Over 4450 Built and Shipped

TOURNAPULLS

Trade Mark Reg. U.S. Pat. Off.

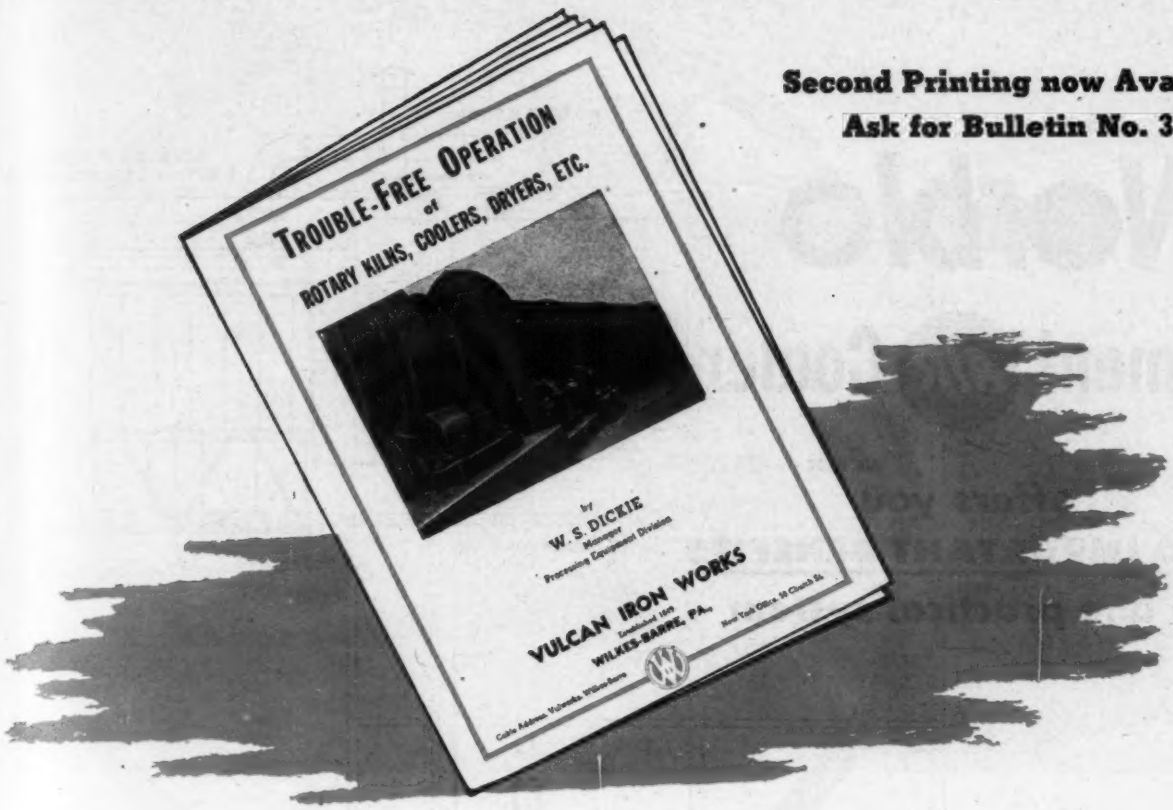
MICHIGAN *Mobile* SHOVEL-CRANE

You can count on your operator maintaining high output rates with a MICHIGAN. It's fast-moving—both on the road and on the job. It's easy to handle, it's economical to operate. That's why it ranks so high in the estimation of operators and owners alike. With operators because its air controlled clutches respond instantaneously and smoothly to the touch of a finger. With owners because it gets every job done sooner, at minimum cost.

FULLY CONVERTIBLE
⅜ YD. and ½ YD. SHOVELS,
6 to 12 TON CRANES
•
FINGERTIP AIR CONTROLS
•
ONE-MAN OPERATION
•
TRUCK MOBILITY

Complete information and specifications on MICHIGAN Mobile SHOVEL-CRANES is available on request. Ask for Bulletin RP-86.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN



Second Printing now Available
Ask for Bulletin No. 389

Twenty Years of Trouble-Shooting boiled down in this FREE Fact-Book!

Demand exceeded the original supply of this valuable reference book for users of Rotary Kilns, Coolers, Dryers, etc. Now, however, a second printing makes it available to all. In it, "Bill" Dickie gives you the full benefit of more than 20 years experience helping the process industries take the "knots" out of kiln operation. In your own language, Bill tells how nearly all the usual mechanical troubles can be prevented . . . and points out practical cures or expedients to keep the job going when trouble does occur. The information in this bulletin can help you maintain peak operating efficiency . . . may even help avoid a costly shutdown. Write to Vulcan for your free copy today, specifying bulletin #389. Tell us, also, about any processing problem or requirement you have within the scope of the Vulcan products below. The full cooperation of our engineering staff is at your disposal without charge or obligation.

VULCAN IRON WORKS

Established 1919

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

Rotary Kilns, Coolers and Dryers	Toothed, Double-Roll Crushers	Heavy-Duty Electric Hoists	Steam Locomotives
Rotary Retorts, Calciners, Etc.	Heavy-Duty Briquetting Machines	Self-Contained Electric Hoists	Diesel and Gasoline Locomotives
Improved Vertical Lime Kilns	Ball, Rod and Tube Mills	Cast-Steel Sheaves and Gears	Diesel-Electric Locomotives
Automatic Quick-Lime Hydrators	Shaking-Chute and Chain Conveyors	Open-Hearth Steel Castings	Electric Locomotives and Larrys

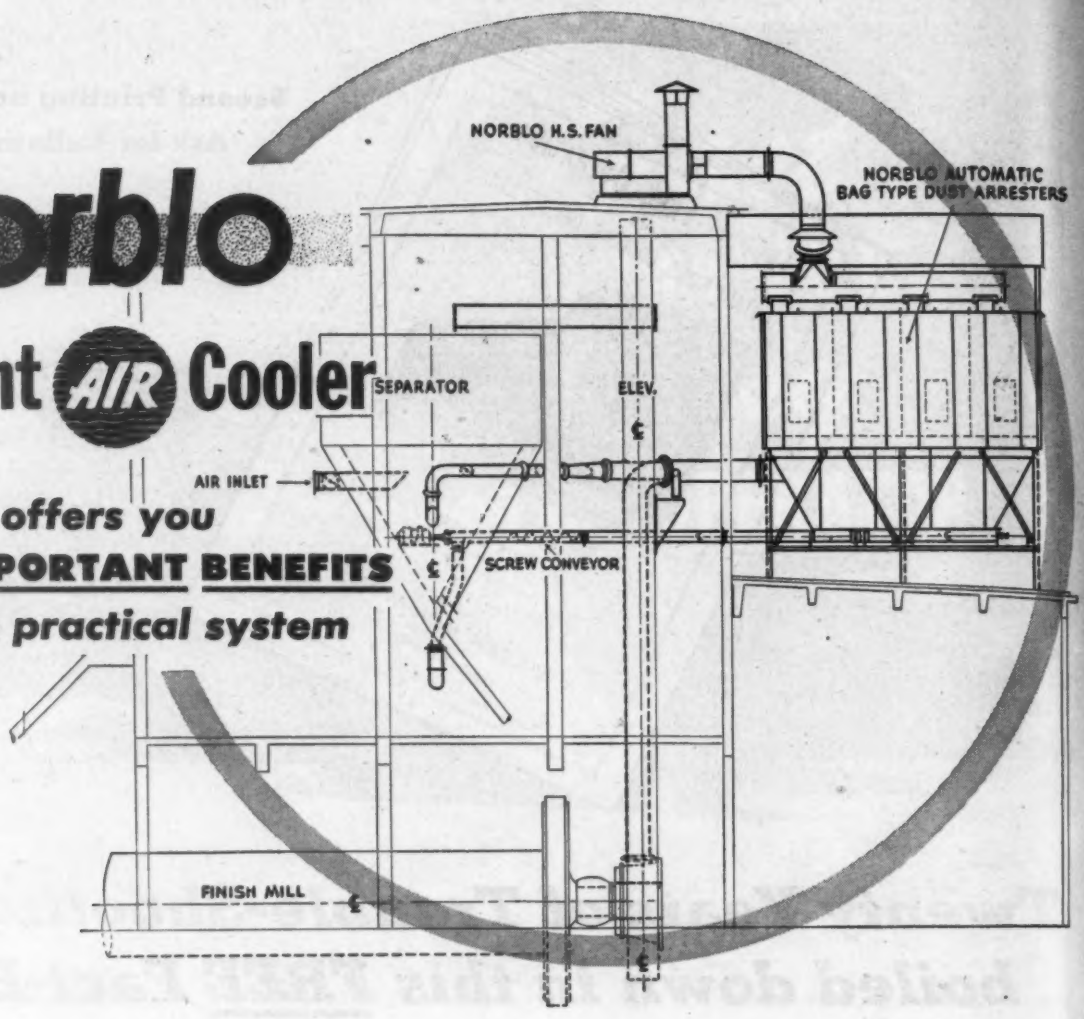
Norblo

Cement AIR Cooler

offers you

TWO IMPORTANT BENEFITS

in one practical system



CEMENT MEN are not easily excited—but all who have investigated Norblo Cement Air-Cooling combined with complete dust collection for the finish mill, in one system, are saying "You've got something there!"

This new system (Pat. No. 2,350,737 by M. A. Eiben) cleans up the entire milling process and increases finish mill efficiency by continuous cooling of fines and tailings. Cement temperature is reduced to 200 degrees or lower, permitting continuous and immediate flow to storage bins. No other cooling equipment required, operating conditions improved, space saved. Write for new circular with plan and elevation of a typical installation.

THE NORTHERN BLOWER COMPANY

6408 BARBERTON AVENUE • CLEVELAND 2, OHIO

"SUPERIOR

TO ANYTHING WE HAVE YET USED"

That's Mr. Hill's description of his Mack trucks.

In the first six months of service, the three Mack EHX's, purchased by **Hill & Combs, General Contractors, San Antonio, Texas,** poured 22,500 cubic yards of concrete . . . operating through heavy, waxy mud, with Mack hauling the load!

Mr. Hill also writes—"We found these trucks plowed through to deliver the load *whenever* and *wherever* it was required."

This owner-praise is not new for Mack . . . but it again spots Mack doing a specific job—a tough job—efficiently, and at minimum cost. Check Mack for service and long-run economy before you buy your next truck!

Mack
TRUCKS
FOR EVERY PURPOSE

Performance Counts!

Mack Trucks, Inc., Empire State Bldg., New York, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities including Toronto and Montreal, Canada.

THE BEST COSTS LESS

TRADE MARK

For years Gar Wood has consistently offered truck and trailer equipment of utmost utility and outstanding value. Leadership in this field resulted from this policy. Gar Wood equipment costs less in the long run because it is better built to give peak performance and lasting satisfaction.

Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.

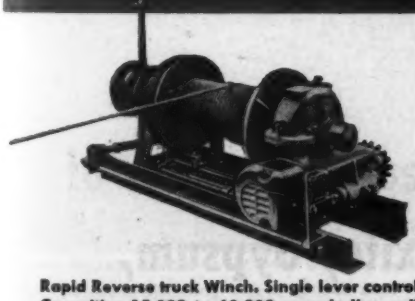
Type X-112 Extra heavy duty Body with automatic downfolding tailgate.

Special rock Body, scoop type rear end. Model F4CA cam and roller Hoist.

Type W12 Body. Model F4C cam and roller Hoist. Capacity 6 cu. yds.

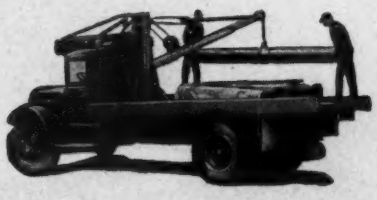
Type X-112 Extra heavy duty Body, scoop end, with Model T-4440 Hoist. Capacity 19 cu. yds.

Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.



Rapid Reverse truck Winch. Single lever control. Capacities 15,000 to 60,000 pounds line pull.

West Coast Special W-12 Body, Model F8C cam and roller Hoist. Capacity 10 cu. yds.



Telescopic boom Crane. Radius 8 to 20 feet.

GAR WOOD INDUSTRIES, INC.

7924 RIOPELLE ST. DETROIT 11, MICH.

WORLD'S LARGEST MANUFACTURERS OF TRUCK AND TRAILER EQUIPMENT

OTHER PRODUCTS: TRUCK TANKS ROAD MACHINERY HEATING EQUIPMENT MOTOR BOATS

Gets the "Go" sign in m

JOY

LOADERS

SHUTTLE CARS

The Proved Way to Lower Production Costs

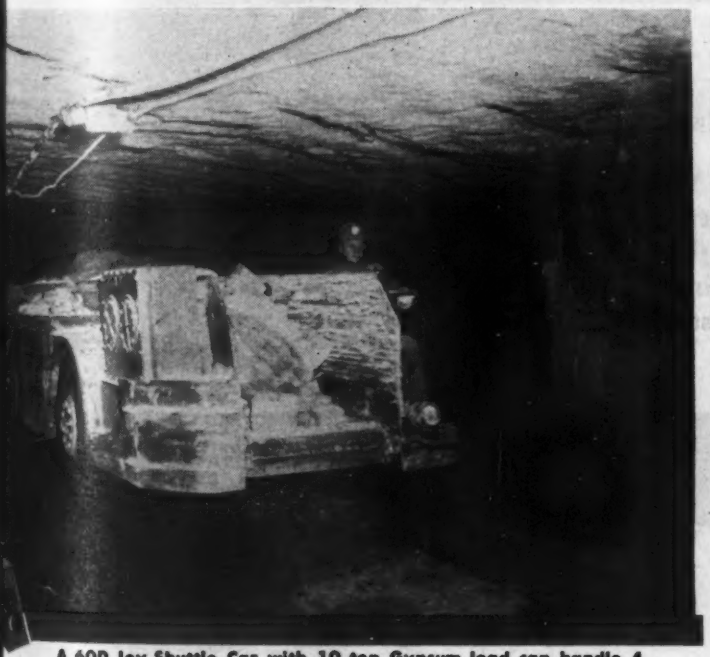
Speed production of Bauxite, Gypsum, Salt, Potash, Iron Ore, Limestone and other ores..

Joy Shuttle Car and Mobile Loader teamwork as shown in this Gypsum mine, means faster clean-up of rock at the face, more tons per man-hour, lower cost-per-ton.

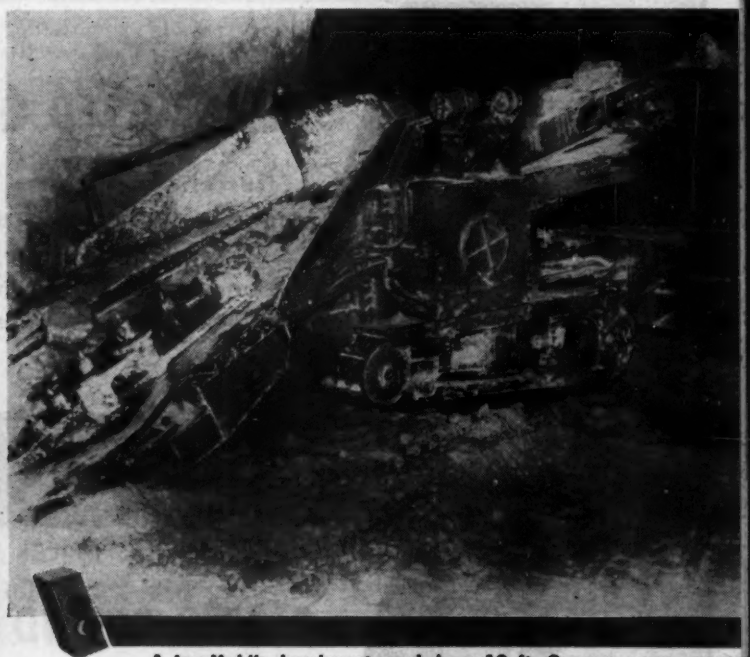
in modern trackless mining

11BU Joy Loaders maintain maximum loading rates . . . set new records for economy in Potash workings. Equally suitable for Bauxite and other products such as Limestone and Gypsum.

Rubber-tired Joy Shuttle Car hauling Potash from face to hoist. Trolley cable furnishes motive power for part of haul; cable reel is attached to secure power to complete the remainder of the trip.



A 60D Joy Shuttle Car with 10 ton Gypsum load can handle 4 more tons without affecting actual speed. Shuttle Cars increase production and cut haulage costs in mines the nation over.



A Joy Mobile Loader at work in a 10 ft. Gypsum seam proves the economy of modern trackless mining with Joy equipment. This unit loads up to 8 tons per minute, speedily, efficiently.

Consult a Joy Engineer

JOY MANUFACTURING CO.

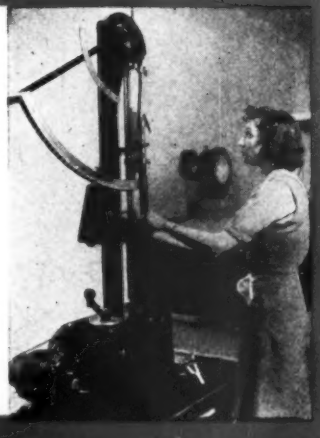
Here are 5 reasons why

...MANY MANUFACTURERS SPECIFY BEMIS MULTIWALL PAPER SHIPPING SACKS

1

CONTROLLED QUALITY

Materials for Bemis Multiwall Paper Shipping Sacks are carefully selected and laboratory tested before they are O.K.'d for use on our production lines. Typical is the tensile strength test, illustrated at right.



2

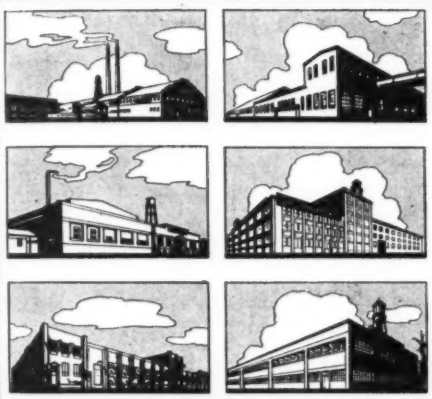
BETTER BRAND PRINTING

Our Six Multiwall plants are equipped with modern printing equipment. Skilled engravers make the plates that reproduce your brand, and our own laboratories develop and test the brilliant colorful inks that are used.

REAL PACKAGING SERVICE

Bemis Multiwall Specialists are always at your service—ready to help you solve tough packaging problems, study your present methods of filling, closing and handling and recommend changes that may lower costs and speed up production.

3



SIX BEMIS MULTIWALL PLANTS

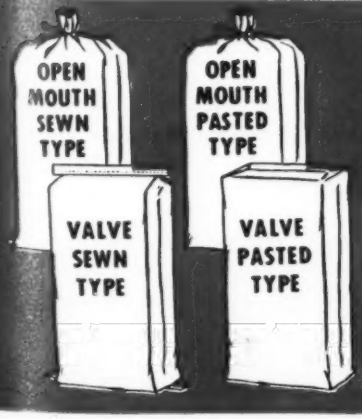
are strategically located North, South, East, and West to provide easy accessibility, quick delivery to your main plant or branches regardless of location. Bemis offices in 26 additional cities assure you of top-notch service.

4

A NATIONWIDE ORGANIZATION

There is a Bemis representative near you because Bemis offices are located in 32 principal cities. When you need Multiwalls, call Bemis. You'll find it pays to be a Bemis Multiwall customer.

5



BEMIS BRO. BAG CO.

Baltimore • Boston • Brooklyn • Buffalo
Charlotte • Chicago • Denver • Detroit
Houston • Indianapolis • Kansas City
Los Angeles • Louisville • Memphis

BEMIS BRO BAG COMPANY

Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City
Omaha • Orlando • St. Louis • Salina
Salt Lake City • Seattle • Wichita

PEORIA, ILL. • E. PEPPERELL, MASS. • MOBILE, ALA. • WILMINGTON, CAL.
SAN FRANCISCO, CAL. • ST. HELENS, ORE.

This G-E 65-tonner in 2½ yrs service at

65-ton G-E diesel-electric hauls nearly a thousand tons up a .5 per-cent grade and around a 17-degree curve.

Consider these advantages of using a G-E diesel-electric

Availability is 90 per cent up! A G-E diesel-electric carries sufficient fuel for many days' operation; needs only periodic inspections; runs for long periods between overhauls.

Starts on the press of a button! No lost time in getting diesel-electric ready for work.

Switching is speeded up by diesel-electric's fast, responsive operation.

Fuel costs are definitely lower than those of any other type of industrial locomotive.

Cleanliness is an important factor, particularly where absence of smoke is essential to avoid injury to products.

Safety is enhanced wherever sparks or hot ashes would be a fire hazard.

Maintenance is simplified by absence of boiler, firebox, and heavy reciprocating parts.

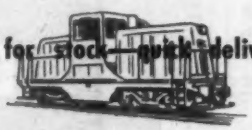
Engine house expense is minimized because no fire cleaning, ash handling, watering, or watching is required.

Track maintenance is low, because of the smooth torque and the short wheelbase of the diesel-electric.

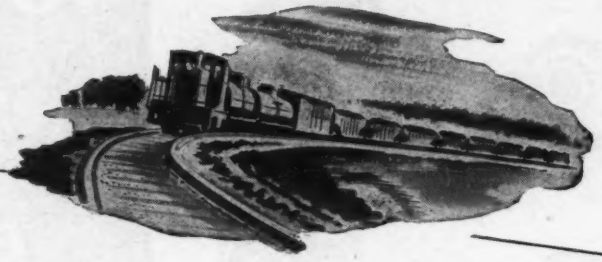
G-E diesel-electrics often return 20 to 30 per cent annually on their purchase price.

diesel-electric *Industrial* LOCOMOTIVES

A standard line—built for stock—quick delivery—low cost



never missed a trip
American Viscose



Hard service hauling long strings of cars up steep grades for 16 hours a day has yet to mar the amazing availability record of this G-E diesel-electric locomotive! In service at the Front Royal, Va., plant of the American Viscose Corporation since October, 1943, this 65-tonner has been on the job whenever needed, ready to go at the touch of a button.

Negotiating curves up to 17 degrees and grades up to 1.5 per cent, this locomotive is hauling loads well in excess of those it was warranted to handle when purchased. As many as 20 cars averaging 50 tons each have been hauled up a .5 per-cent grade without difficulty.

The freedom from smoke and the danger of sparks are also important factors. For this locomotive must operate where valuable rayon and staple fibres are loaded. As compared to the steam-charged locomotive also used at this plant, moreover, it has cut fuel costs, eliminated hourly time-outs for charging, and saved hundreds of dollars in maintenance.

Why not let a G-E engineer make a survey of your motive power needs with an eye to cutting your costs for switching, spotting, and hauling? He can recommend the size of diesel-electric best adapted to your plant.

APPARATUS DEPARTMENT
GENERAL ELECTRIC
SCHENECTADY, N. Y.

RAYMOND

MECHANICAL AIR SEPARATOR

THIS double whizzer Separator is *made to order* for cement classification, and is used by many modern plants as the key unit in closed circuit grinding operations.

It makes product control easier by providing a sufficiently wide range in surface area to produce the various grades from standard cement to high early strength cement. By properly setting the mill for the different grades of fineness required, it is possible to obtain the necessary variation in surface area by outside adjustments of the vertical slide dampers.

The whizzer action also improves results. The revolving whizzer blades, cutting across the air stream, assure more positive rejection of the oversize, closer separation of the fines, and cleaner tailings.

The net result is a continuously uniform finished material, and a reduced per-barrel-cost due to greatly increased mill capacities.

FOR SERVING THE

Built in nine commercial sizes from 2'6" to 18'0" diameter . . . with single or double whizzer, for a fineness range of about 50-mesh to 99.9% passing 400-mesh.

Extra high efficiency in separating raw mix or finish cement, as well as for lime, gypsum, clays, and other non-metallic minerals and manufactured products.

Single whizzer type of Raymond Mechanical Air Separator

LABORATORY SEPARATOR

For classifying test samples or small lots of powdered materials. Complete motored unit with hand-operated screw feeder.

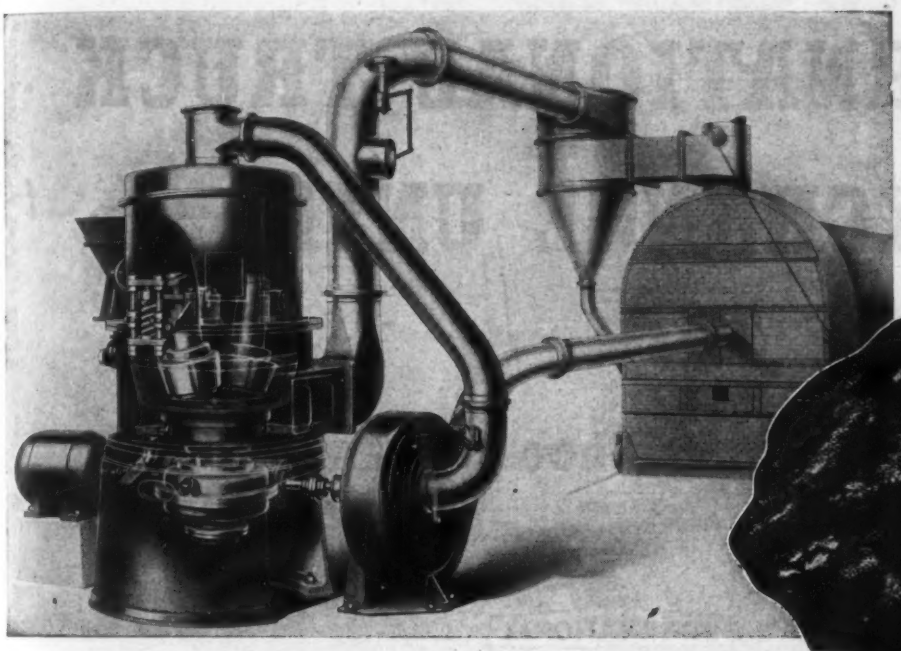
Write for CATALOGS and Bulletins

RAYMOND

1307 North Branch St., Chicago 22

Sales Offices in Principal Cities

RAYMOND BOWL MILL



COMPLETE FIRING CONTROL *plus* **MAXIMUM KILN EFFICIENCY**

CEMENT INDUSTRY

BOWL MILL FIRING is the first step in putting your rotary cement kilns on a long-term economy basis. It meets all the requirements of the modern plant:—

- Handles any grade or moisture coal
- Uniform grind at all rates of feed
- Easily adjusted or lubricated while running
- Built for 24-hour operation, month after month
- Wide range capacity by varying rate of feed
- Panel board control for groups of mills

Direct firing with the Bowl Mill shows important savings over the central bin system for all types of rotary kilns . . . cement, lime, dolomite, magnesium and industrial furnaces.

Write for Bowl Mill Catalog No. 43

- **High Availability**
- **3-Point Fineness Control**
- **No Metal-to-Metal Contact in Pulverizing**
- **Automatic Tramp Iron Disposal**
- **One Constant-Speed Motor for Mill and Fan**
- **Noiseless, Dustless Operation**

PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.
Canadian Combustion Engineering Corp. Ltd., Montreal

SINCE 1887

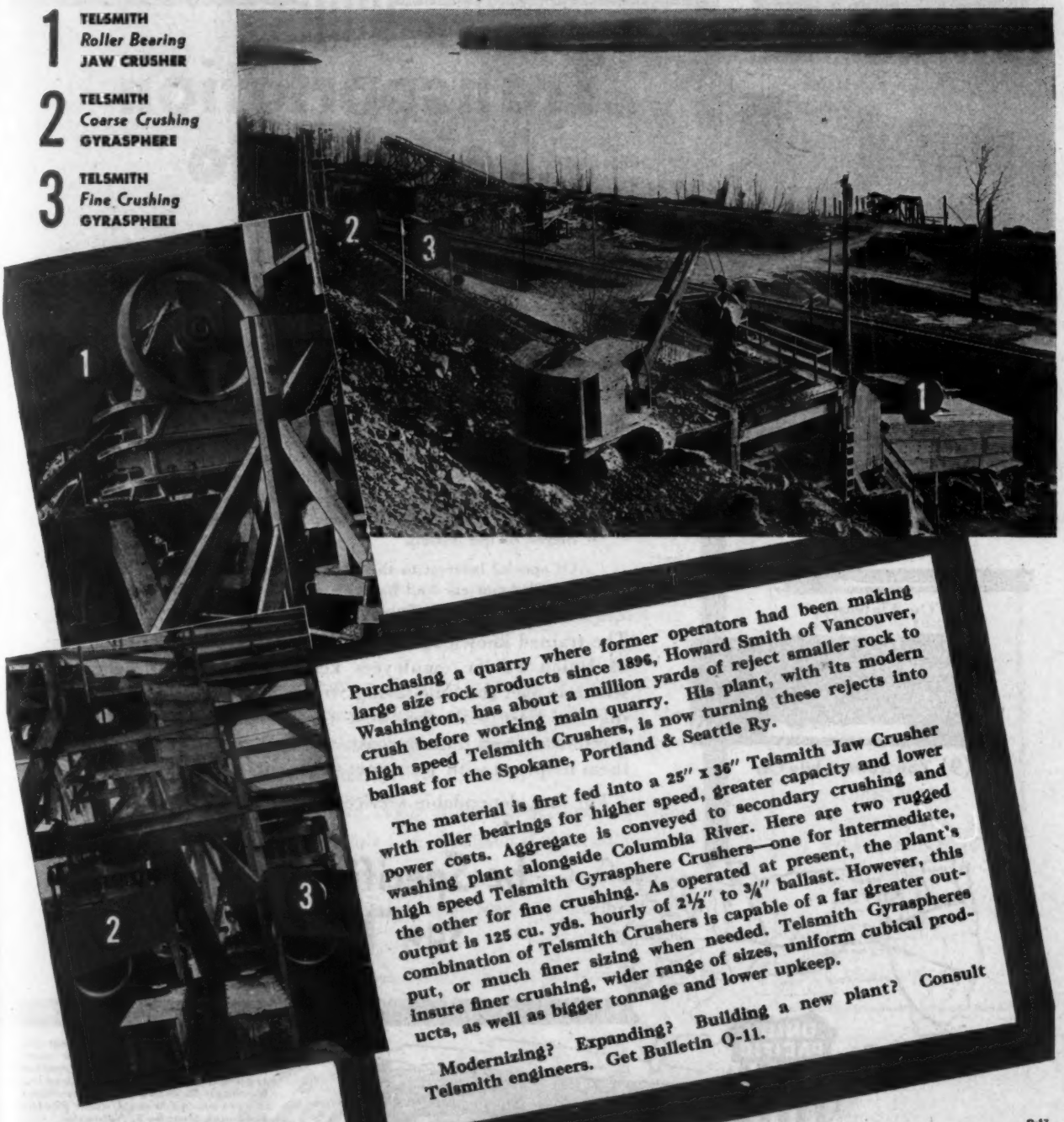
Ballast...125 cubic yards HOURLY...

WITH TELSMITH

1 TELSMITH *Roller Bearing* JAW CRUSHER

2 TELSMITH *Coarse Crushing* GYRASPHERE

3 TELSMITH *Fine Crushing* GYRASPHERE



Purchasing a quarry where former operators had been making large size rock products since 1896, Howard Smith of Vancouver, Washington, has about a million yards of reject smaller rock to crush before working main quarry. His plant, with its modern high speed Telsmith Crushers, is now turning these rejects into ballast for the Spokane, Portland & Seattle Ry.

The material is first fed into a 25" x 36" Telsmith Jaw Crusher with roller bearings for higher speed, greater capacity and lower power costs. Aggregate is conveyed to secondary crushing and washing plant alongside Columbia River. Here are two rugged high speed Telsmith Gyrasphere Crushers—one for intermediate, the other for fine crushing. As operated at present, the plant's output is 125 cu. yds. hourly of 2½" to ¾" ballast. However, this combination of Telsmith Crushers is capable of a far greater output, or much finer sizing when needed. Telsmith Gyraspheres insure finer crushing, wider range of sizes, uniform cubical products, as well as bigger tonnage and lower upkeep.

Modernizing? Expanding? Building a new plant? Consult Telsmith engineers. Get Bulletin Q-11.

Q-17

SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

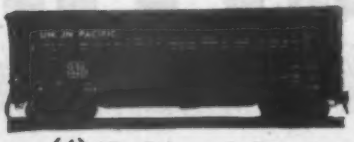
51 East 42nd St. New York 17, N.Y. | 211 W. Wacker Drive Chicago 6, Ill. | 713 Commercial Trust Bldg. Philadelphia 2, Pa. | 247 Third St. Cambridge 42, Mass. | Beebek Eqpt. Co. Milwaukee 3, Wis. | Mines Eng. & Eqpt. Co. San Francisco 4—Los Angeles 14

Brandeis M. & S. Co. Louisville 8, Ky. | Rish Equipment Co. Charleston 22 & Clarksburg, W. Va. | Rish Equipment Co. Roanoke 7 & Richmond, Va. | North Carolina Eqpt. Co. Raleigh, Charlotte 1, Asheville, N.C. | Wilson-Woesner-Wilkinson Co. Knoxville 8 and Nashville 6, Tenn.

(3) The Covered Hopper Car

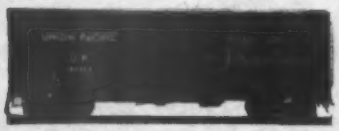
(2) The Tank Car

(1) The Hopper Car



(4) The Livestock Car

(5) The Refrigerator (P.F.E.) Car



(6) The Box Car

(7) The Gondola

(8) The Flatcar

(9) The Automobile Car

UNION PACIFIC

Transportation Tailored to *your* INDUSTRY

To most effectively meet the needs of American Industry, Union Pacific provides a fleet of freight cars specifically designed to transport all types of materials and merchandise.

Sturdily constructed and efficient in mechanical operation are the various types of freight cars pictured on this page. This safe, dependable rolling stock is a vital factor in providing transportation for the commerce of the nation.

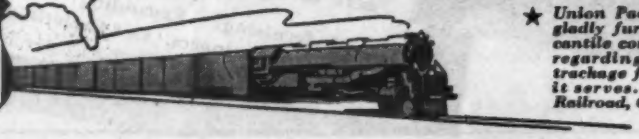
Of special interest to the Cement Industry is the covered hopper car and box car, Figs. 3 and 6, used for the shipment of bulk and cement products.

The trained knowledge and experienced skill of thousands of Union Pacific employees keep shipments rolling on schedule over the time-saving Strategic Middle Route, uniting the East with the West Coast. Experienced traffic specialists, from coast-to-coast, are ready to assist you. Let them help you with your *next* shipment.

For fast, dependable service . . .

be Specific – say "Union Pacific"

UNION PACIFIC



★ *Union Pacific will, upon request, gladly furnish industrial or mercantile concerns with information regarding available sites having trackage facilities in the territory it serves. Address Union Pacific Railroad, Omaha 2, Nebraska.*

UNION PACIFIC RAILROAD

The Strategic Middle Route

GENERAL AMERICAN ROTARY KILNS

General American Rotary Kilns produce a quality product at a low rate of fuel consumption because of many modern features employing the best elements of kiln design.

One outstanding feature helping to produce cement at lower costs is the new improved air seal which gives you better control of the fuel-air mixture. This assures better balanced combustion and thus a more uniform higher quality product.

A sturdy motor-generator drive, easily aligned rollers, and pressure oil feed throughout assure trouble-free mechanical operation.

Because Rotary Kilns are manufactured in General American's own shops, you secure the benefits of undivided responsibility for their satisfactory performance.

Ask for further details on these Rotary Kilns at your nearest General American office.

OTHER GENERAL AMERICAN EQUIPMENT

FILTERS
CALCINERS
DRYERS
SIZERS
TURBO-MIXERS
DEWATERERS
HYDROSEPARATORS
BINS
STORAGE TANKS
KETTLES
LADLES
STEEL STACKS

General American
TRANSPORTATION CORPORATION
process equipment • steel and alloy plate fabrication
SALES OFFICE: 515c Graybar Bldg., New York 17, N. Y.
WORKS: Sharon, Pa.; East Chicago, Ind.
OFFICES: Chicago, Sharon, Louisville, Salt Lake City, Pittsburgh, St. Louis, Cleveland, Orlando, Washington, D. C.

GATX GENERAL AMERICAN

Announcing...

the arrival of another new Cedarapids Portable Crushing Plant

THE PITMASTER STRAIGHTLINE

Cedarapids Built by IOWA

small in size but BIG in low-cost production

THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS—STEEL BINS • BUCKET ELEVATORS • VIBRATOR AND REVOLVING SCREENS • STRAIGHT LINE ROCK AND GRAVEL PLANTS • FEEDERS—TRAPS • PORTABLE POWER CONVEYORS • PORTABLE STONE PLANTS • PORTABLE GRAVEL PLANTS • REDUCTION CRUSHERS • BATCH TYPE ASPHALT PLANTS • TRAVELING (ROAD MIX) PLANTS • DRAG SCRAPER TANKS • WASHING PLANTS • TRACTOR-CRUSHER PLANTS • STEEL TRUCKS AND TRAILERS • KUBIT IMPACT BREAKERS

Yes, sir! We're the proud parents of a new husky youngster that gives every promise of living up to the records of low-cost production of quality aggregate established by its big brothers, the Cedarapids Junior and Master Tandems. Operators are reporting production of more than 50 tons per hour of ½" material with 55% crushing.

10" x 16" roller bearing jaw crusher and 16" x 16" roller bearing roll crusher give you plenty of crushing output. Horizontal vibrating screen assures greater capacity, closer grading, higher efficiency and requires less head room. Available with chip screen, hopper and feeder or swivel feed conveyor. Fast, easy set-up and take-down minimize lost time between jobs. No drives to connect. Conveyors swing easily into position.

When buying a crushing plant — buy the best — buy Cedarapids. If your requirements are moderate — buy a Pitmaster Straightline.

Iowa Manufacturing Company
Cedar Rapids, Iowa

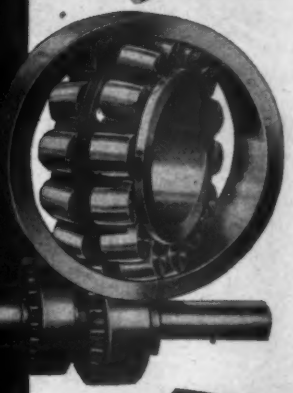
THESE ARE THE THINGS
That Boost Production

MAIN FRAME
of welded, high carbon steel plates, combines tremendous strength with light weight.

HEAVY PITMAN
is accurately bored to accommodate the precision eccentric bearings.

S.K.F. BEARINGS
of self-aligning type, protect load-bearing surfaces.

MAIN SHAFT
is forged, heat-treated, machined, ground, and polished.



BEARING ASSEMBLY
minimizes shaft strain by mounting main and pitman bearings close together.

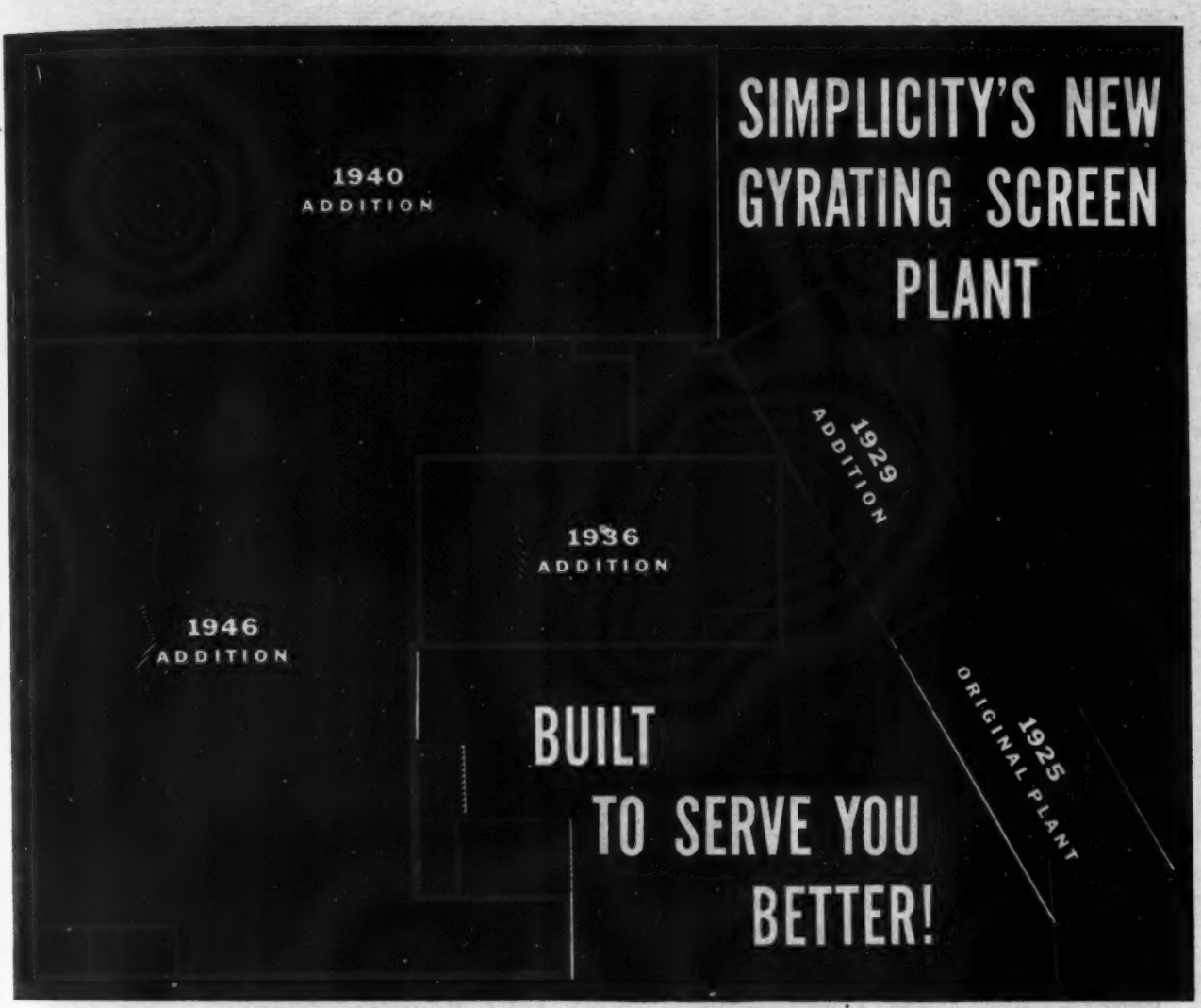
STEEL TOGGLE
is of uniform width, and proper and uniform strength.

• Pictured on this page are but a few of the many exclusive features of design and construction which are responsible for the ability of *Austin-Western High-Speed Jaw Crushers* to exceed ordinary output standards by wide margins.

Bulletin 1960 tells the whole story. Your nearby A-W distributor will be glad to send you a copy.

AUSTIN-WESTERN COMPANY
AURORA, ILLINOIS, U. S. A.

BUILDERS OF ROAD MACHINERY
Austin Western
SINCE 1859



This is a floor plan of the plant your purchases of Simplicity Gyrating Screens have built.

With the new addition (completed this month) our Simplicity plant now has more than 16 times the floor area of the plant built in 1925, and double the floor area of the plant before its latest enlargement.

This August, 1946, addition includes a 35,000 electric oven so that we may stress relieve all welded parts of your new Simplicity Screens without adding one day to the production time. Major welded parts have been stress relieved for several years (to give added life and rugged performance to each screen), but this is the first time we have used our own oven and the first time it has not meant delay in processing.

Thanks for your Simplicity Screen buying preference which makes possible this modern, highly-equipped Simplicity Plant.

We pledge to produce, even better and even faster, the Simplicity Gyrating Screen which is the most widely-used, preferred separation equipment for modern aggregates plants throughout the world.

Write for details about the Simplicity Gyrating Screen with its newest engineering and structural improvements.

Simplicity

TRADE MARK REGISTERED

ENGINEERING COMPANY

DURAND, MICHIGAN

Where B-G *Belt Conveyors* mean Peak Production

• Peak production at low cost are two reasons behind the success of this modern ready-mix concrete plant. And much of its high capacity and low operating costs are due to skillful application of B-G Permanent Belt Conveyors in unloading and charging operations.

Built in a variety of sizes, types and capacities, B-G Belt Conveyors assure the constant flow of materials so desirable in any aggregate-handling plants. Pre-engineering of these factory-built conveyors minimizes delays for special engineering and cost estimates.

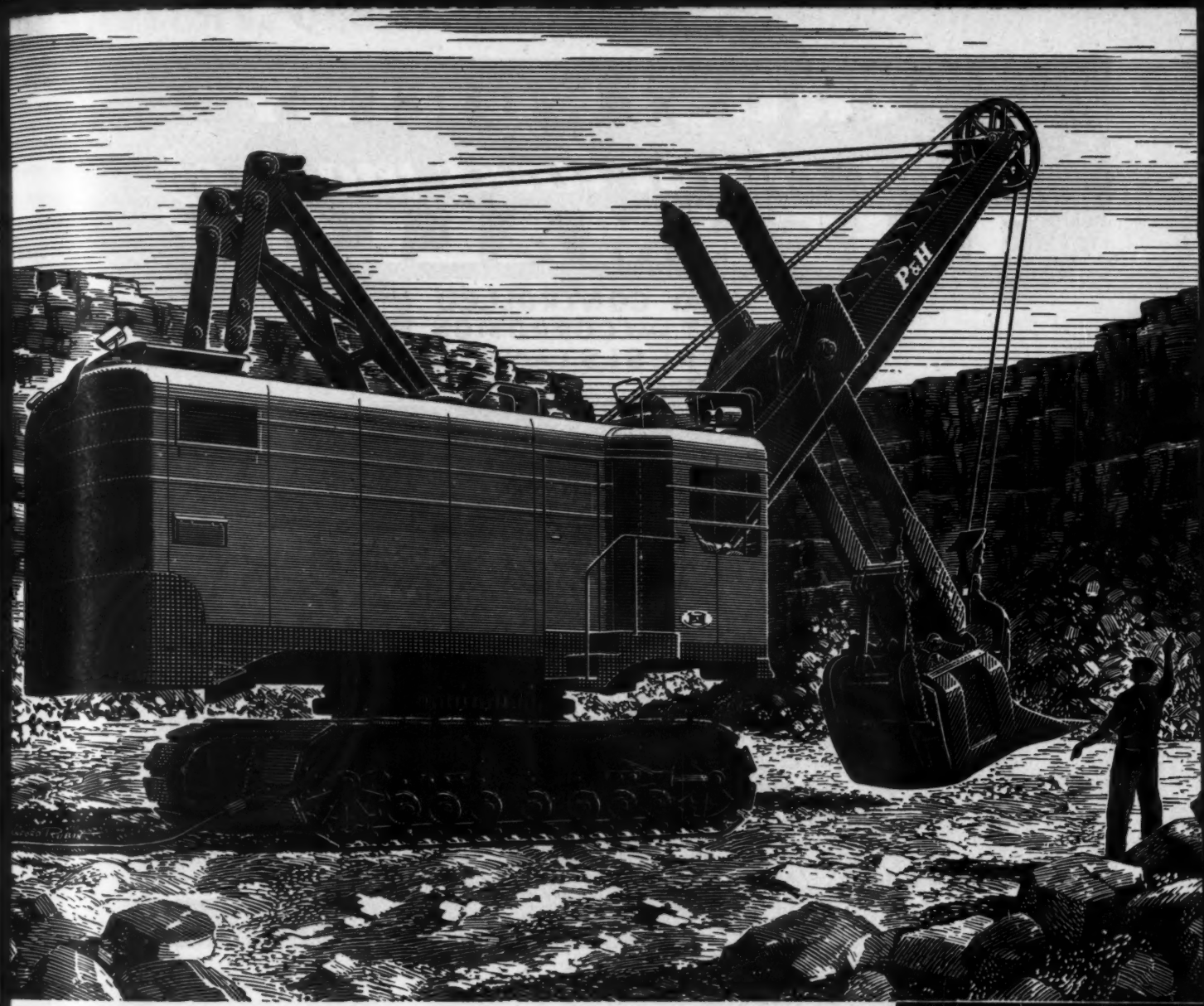
Often, B-G Belt Conveyors can be installed by your own workmen. Standardized units are conveniently marked—assembled by bolting the units together. Barber-Greene Company, Aurora, Illinois.

Left—276' B-G conveyor system carries sand, gravel and other aggregates to hopper 65' from the ground.

Right—B-G Undercar Conveyor unloads aggregates.

B-G Barber-Greene CONSTANT FLOW EQUIPMENT

LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES



We Moved OUT the Move-up Problems

How many times a day must your shovel move up to a new digging position?

Whether it's one or a hundred, you'll save more than half the amount of time on every move up with a modern P&H electric shovel.

That's because P&H has eliminated all the old complexities by providing a separate heavy duty shovel type motor for propelling — completely independent of all hoisting and swinging motions.

With a P&H, you have no sliding gears to manipulate, no mechanical clutches to engage and disengage. You have only to flip the master propel switch and the machine is ready to move up, instantly. It's simpler and easier, of course. But the important advantage is the time saved to increase production — to cut tonnage costs.

P&H's independent propel motor is only one of many progressive ideas you'll find contributing to steadier, bigger production in all kinds of open pit operations. It is one example of P&H's 60-year experience in applying electrical power to the movement of heavy loads. Ask for complete information.

P&H ELECTRIC SHOVELS

HARNISCHFEGER CORPORATION

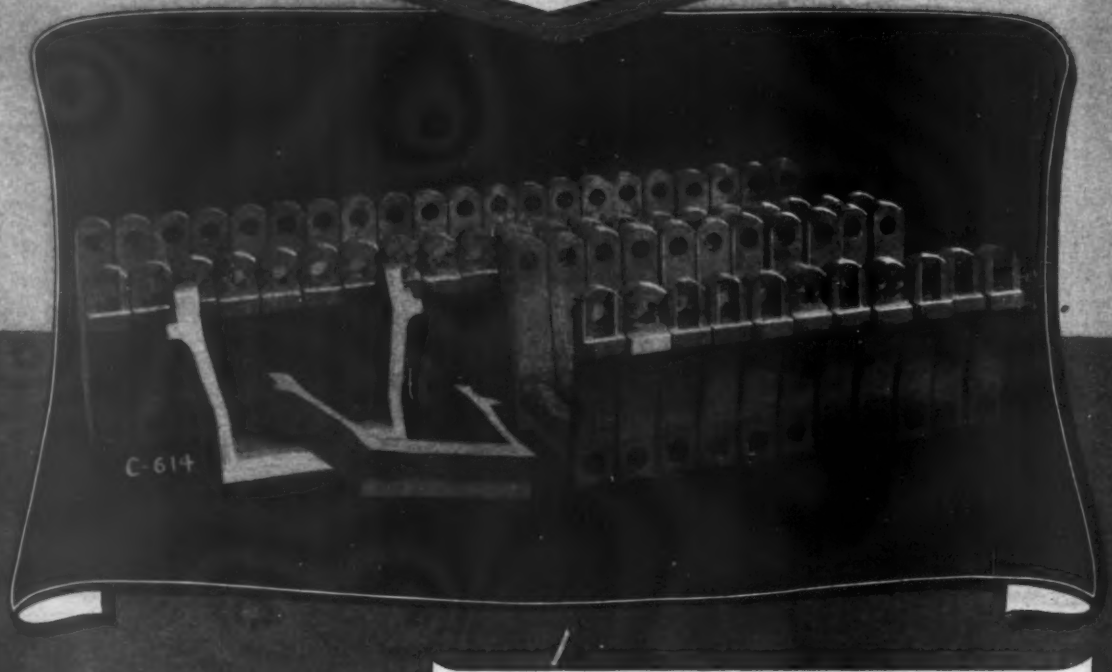
EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · HOISTS · WELDING ELECTRODES · MOTORS

4465 W. National Ave. Milwaukee 14, Wis.

LEADING THE WAY IN ELECTRIC SHOVEL DEVELOPMENTS

TRUSTWORTHY
drag chain links made of
THERMALLOY

X-RAY CONTROLLED
HEAT *and* CORROSION
RESISTANT



AMSCO ALLOY *and* THERMALLOY
are identical

THERMALLOY drag chain for clinker coolers, is designed to take heavy loads and tough usage where stress and strain would ordinarily cause serious break downs. Resistant to corrosive gases and elevated temperatures, THERMALLOY drag chain is trustworthy.

Your inquiry will receive prompt attention by competent men skilled in the manufacture of alloy equipment for kilns.

- ✓ NOSE RINGS
- ✓ FEED PIPES
- ✓ BURNER PIPES
- ✓ DAMPERS
- ✓ COOLER GRATES

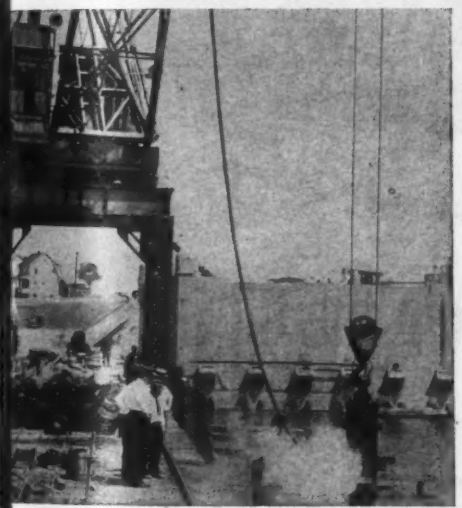
Thermalloy
ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO.
X-RAY CONTROLLED
AMERICAN Brake Shoe COMPANY
HEAT AND CORROSION RESISTANT CASTINGS

Contractors, Quarriers, Miners *Prefer* MODERN, WELL-BALANCED *Condor* HOSE

Manhattan makes a completely engineered line of hose that has consistently helped to lower costs and speed up schedules. Development of Condor hose constructions has kept pace with advancing methods of operation for more than half a century and today, as always, the Condor line sets the standard for rubber hose. Three factors that make Condor hose "the better buy" are (1) FLEXLASTICS—Manhattan's own rubber compounds, (2) STRENGTH MEMBERS—special construction features, (3) MANUFACTURE and DESIGN—53 years of high standards.

Condor HOMO-FLEX WATER HOSE gives exceptional service on rugged road work where hose is constantly twisted and dragged over rough ground, rocks, stakes, etc. Safe at working pressures of 150 to 350 lbs. per square inch according to diameter.

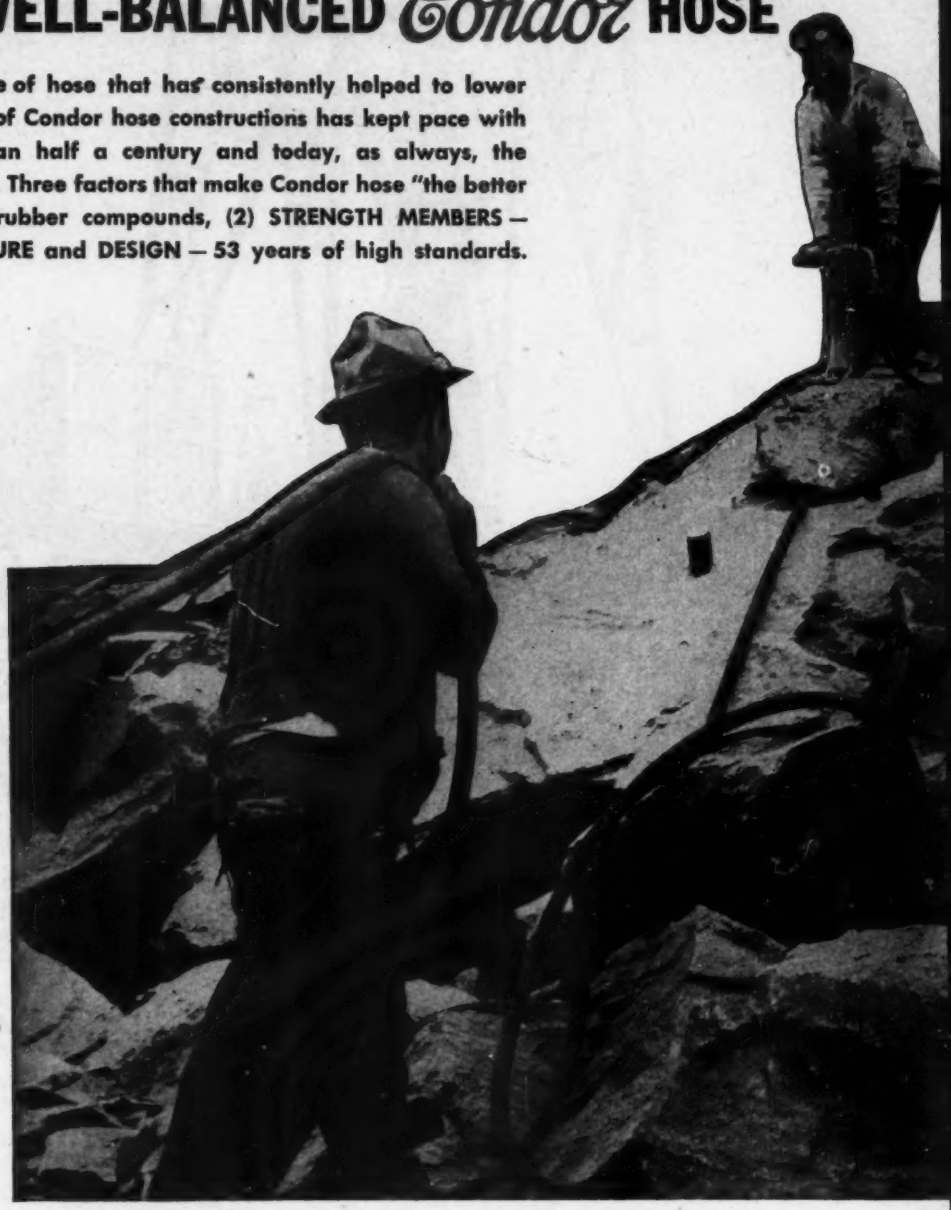
Condor HOMO-FLEX AIR HOSE—Freedom from kinking. Lighter, easier to pull in long lengths. Resists the gouging and abrasion of jagged rock and stands the hammering pressure of an air drill. Men like "easy-to-handle" Homo-Flex.



Condor PILE DRIVER STEAM HOSE has driven the piles that hold some of the largest structures. Contractors prefer Condor because it is always up to standards of safety and long life.

Condor HOMO-FLEX SUCTION HOSE, non-metallic reinforced, for safety in mines and for general service. Returns to original shape if crushed.

Condor SAND SUCTION HOSE for heavy duty sand suction and dredging. Engineered to resist collapsing under suction and discharge pressures.



10 ADVANTAGES OF HOMO-FLEX HOSE

1. Extreme flexibility—easy to handle
2. Resists kinking
3. Light in weight
4. Practically inseparable cover and plies—balanced homogeneous construction
5. Withstands high pressures and surges with wide margin of safety
6. Uniform inside diameter
7. Less elongation and expansion
8. Less fatigue to operator
9. More production
10. Lower ultimate cost

Condor HOMO-FLEX HOSE

Developed by Manhattan engineers to fill a need for a lighter, more flexible, streamlined hose that would last longer than conventional type hose. New Homo-Flex construction withstands destructive pulsations of pressure. Turnate Vulcanization makes an inseparable and uniform nose wall. In services where frequent handling and high pressures break down heavier hose, men are enthusiastic for Homo-Flex, the modern streamlined hose.

FLEXLASTICS is an exclusive Manhattan trade mark. Only Manhattan can make FLEXLASTICS.

RAYBESTOS-MANHATTAN, INC.

EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSEY

GM "Quad 6"

For Great Diesel Power

take a cue from the Oil Fields

WHY are more and more drillers turning to General Motors Diesel engines?

Drilling for oil is 24-hour-a-day work, so an oil man's power has to be dependable.

It has to be able to take on increasing loads as the well gets deeper. It has to be reliable and require the minimum of maintenance. And it has to be portable.

GM Diesels fill all the oil-drillers' musts—then give them more. They are compact and powerful. They can be moved into a job fast and out again when it's done.

So whatever needs for power you may have in road-making machinery, cranes, shovels or any other construction equipment—look to GM Diesels.

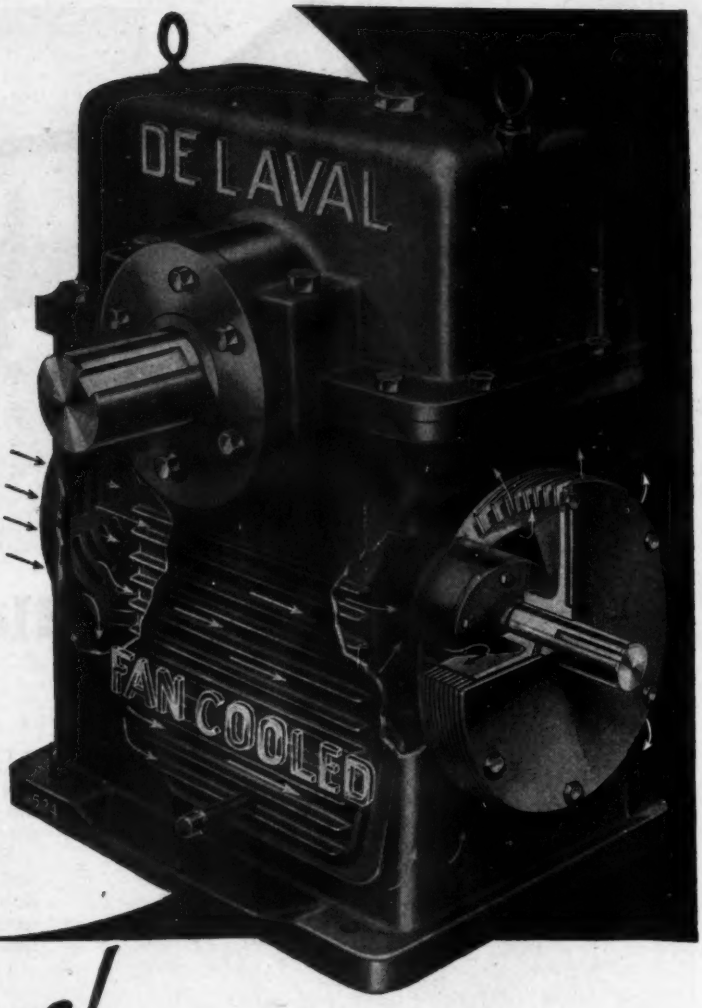
Features of GM Diesels Important to Every User of Power

- ***QUICK TO START*** on their own fuel
- ***LOW COST***—run on common fuel oil
- ***EASY TO MAINTAIN***—clean design plus accessibility
- ***LESS FIRE HAZARD***—no volatile explosive fuel
- ***COMPACT***—readily adaptable to any installation
- ***SMOOTH OPERATION***—rotating and reciprocating forces completely balanced
- ***QUICK ACCELERATION***—2-cycle principle produces power with every downward piston stroke

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION
DETROIT 23, MICH. • { SINGLE ENGINES . . Up to 700 H.P. / MULTIPLE UNITS . . Up to 800 H.P.
GENERAL MOTORS

NEW DE LAVAL FAN COOLED WORM GEAR



Lifts ceiling on capacity ratings!

Heretofore the capacity of non-cooled worm gears has been limited, not by the strength of materials, but by the ability of the casing to liberate heat. With fan-cooling, the capacity is approximately doubled at speeds at 1750 r. p. m. Higher ratings, in turn, permit the use of smaller, lighter, and less expensive units without sacrifice of durability or reliability. • A fan mounted directly upon the high speed shaft draws air at high velocity around and under the ribbed inner wall of the oil reservoir. The ribs increase the heat dissipating surface, while the outer housing serves to confine and direct the air stream, thus cooling the unit most efficiently. • Stock models will soon be available. Ask to have your name placed on our mailing list for literature.

1151

TURBINES • HELICAL GEARS and WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

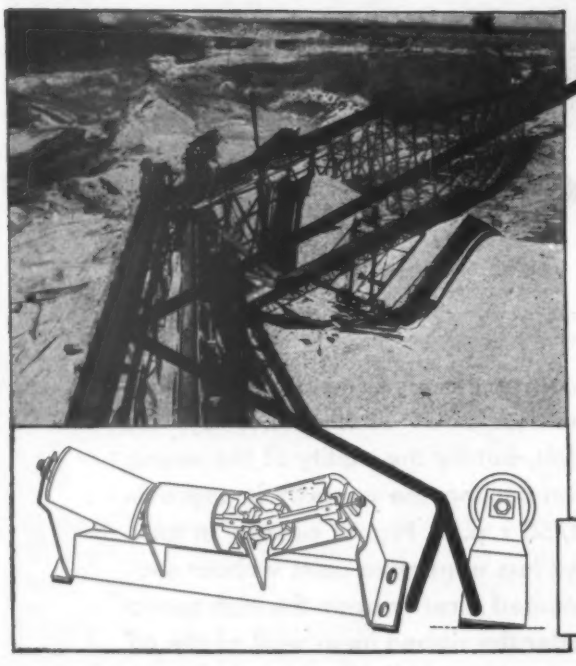
WORM GEAR DIVISION

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG

We tilt the idlers...



Here's a close-up of a PIONEER troughing idler. It's one of many reasons why PIONEER conveyors are most efficient for carrying all types of material for long or short distances.

Each PIONEER idler is a unit in itself . . . complete and interchangeable. The inverted angle base is strong, light in weight, and self-cleaning. Labyrinth seals retain the grease and protect the TIMKEN tapered bearings from dust and grit.

PIONEER conveyors are furnished assembled in standard sections or knocked down for assembly on the job. Portable conveyors, often used as auxiliary units, are ideal for filling cars or building stock piles. PIONEER portable conveyors are mounted on a new conveyor truck with hydraulic raising mechanism. They are easy to move and will save you time and money on every job.

Let PIONEER conveyors carry the load and you can be certain of a constant, smooth flow of material at lower cost per ton. Write today for complete details.

WE TILT THE IDLERS in the direction of belt travel for constant belt alignment. Feeding toward the center, the belt runs straight and true.

PIONEER ENGINEERING WORKS, INC.
1515 CENTRAL AVENUE • MINNEAPOLIS 13, MINNESOTA

Engineers and Manufacturers of Quarry—Gravel and Mining Machinery

PLAN WITH

Pioneer

ENGINEERING WORKS

Dependable

FULL TIME PRODUCTION AT

CLIMAX

1 Plant and residential area the Climax Molybdenum Co. Climax, Colorado.

2 WILFLEY Acid Pumps in the Langeloth Conversion plant of the Climax Molybdenum Company.

3 Two of the many WILFLEY Sand Pumps in the Climax Molybdenum Mill, Climax, Colorado.

In the great CLIMAX plants—and in many others throughout the world—**WILFLEY** pumps maintain an enviable reputation for continuous, trouble-free, high-efficiency performance. Exclusive principles of design and construction, plus individual engineering on every application, make this "the pump to buy" when true high efficiency is required in the handling of sands, slimes, slurries or acids. Write for complete details.

WILFLEY
centrifugal PUMPS

A. R. WILFLEY & SONS, Inc.
DENVER, COLORADO, U.S.A.
New York Office: 1775 Broadway, New York City

(ABOVE)—A unit of "Nitramon" in place in the quarry tunnel and (RIGHT)—the roller wheel conveyor on which "Nitramon" was brought into tunnel.

Another Successful "NITRAMON" Tunnel Shot

A Typical Du Pont Technical Service Story

In a New Jersey quarry recently, Du Pont Technical Service Representatives laid out and supervised the loading of another "Nitramon" tunnel shot. Laterals measured 238' overall, extending 121' and 117' at right angles from a 46' adit. Overhead burden ranged from 62' to 67'.

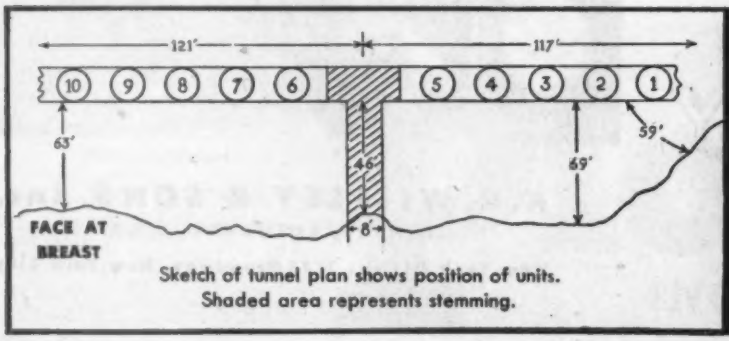
The charge of "Nitramon" approximated 31,900 pounds and was loaded in ten units indicated in the field sketch reproduced below. Each unit had three "Nitramon" primers. Electric light throughout the tunnel facilitated loading and a roller-skate wheel conveyer speeded up the job.

"The shot gave a very satisfactory tonnage of stone and was successful in every way," reported the Du Pont Service men.

The safety and performance of "Nitramon" are winning the approval of quarry operators everywhere. The sturdy metal cans are easy to handle. They simplify loading . . . reduce risk of breakage or spoilage due to wet working conditions. And "Nitramon" insures freedom from headaches. Whenever you have a quarry blasting problem . . . ask your Du Pont Technical Service Representatives about the possibilities of "Nitramon."

"NITRAMON" IS SO SAFE THAT IT CANNOT BE DETONATED BY BLASTING CAPS, OPEN FLAME, OR EVEN THE IMPACT OF A RIFLE BULLET. YET A COMBINATION OF "NITRAMON" PRIMER AND PRIMACORD DETONATED BY AN ELECTRIC BLASTING CAP READILY FIRES THIS SAFEST BLASTING AGENT.

E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT
WILMINGTON 98, DELAWARE



Sketch of tunnel plan shows position of units.
Shaded area represents stemming.

DU PONT "NITRAMON"

A Product of Du Pont Explosives Research

DU PONT

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

Vanderwerp Type S Recuperator applied to Unit Fired Rotary Cement Kiln 11 ft. x 400 ft. *(Repeat Order)*

3 Outstanding DEVELOPMENTS TO REDUCE PRODUCTION COSTS

1. VANDERWERP RECUPERATOR for rotary kilns insures immediate quenching and maximum heat recovery.

2. MINOGUE SLURRY AGITATOR provides thorough agitation and blending with minimum power and air consumption.

3. MINOGUE KILN FEEDER—The only practical device for introducing flue dust in dry state.

The wide acceptance of the Vanderwerp Recuperator in the United States has led to important installations in South America, Australia and the Philippines.

The demand for units of high capacity has resulted in our Type S design suited to kilns of maximum output. In all cases the Recuperator may be readily attached to an existing kiln, requiring the minimum of labor in erection, involving no foundations or brickwork and occupying minimum floor space.

MANITOWOC ENGINEERING WORKS
Division of
Manitowoc Ship Building Company
GENERAL OFFICES AND PLANT
Manitowoc, Wisconsin
CHICAGO OFFICE
111 E. Wacker Drive

22° LIFT

with this A-Frame
Heavy Duty, Mobile

DIAMOND CONVEYOR

LOADS ROCK GRAVEL, SAND, ORE

For adaptability to location and type of material, and the ability to slug it out year after year on the heaviest runs—this DIAMOND A-Frame Conveyor is tops! It is electrically welded throughout. Frame and power unit are centered for proper balance. Self-locking raising and lowering gears; will raise to 22° angle. DIAMOND makes other standard conveyors as well as crushers, screens, plants, etc.

Ask for Conveyor Bulletin No. D45E

DIAMOND CONVEYOR ROLLS

have rugged electric welded steel frames and greased-for-life ball bearings sealed against dirt. Ask your DIAMOND dealer or write us for details, prices, etc.

OTHER DIAMOND PRODUCTS

- Portable Crushing & Screening Plants
- Portable Primary Crushing Plants
- Portable Screening & Washing Plants
- "DUAL-ACTION" Crushers
- Jaw Crushers
- Hammermills
- Conveyors
- Vibrating Screens
- Scalping Screens
- Drag Washers
- Feeders
- Bins—Hoppers
- Grizzlies

"THERE'S NOTHING TOUGHER THAN A DIAMOND"

DIAMOND IRON WORKS, INC.
AND THE MAHR MANUFACTURING CO. DIVISION
1800 SECOND STREET NORTH MINNEAPOLIS 11, MINNESOTA

EUCLIDS have the Backbone to take it

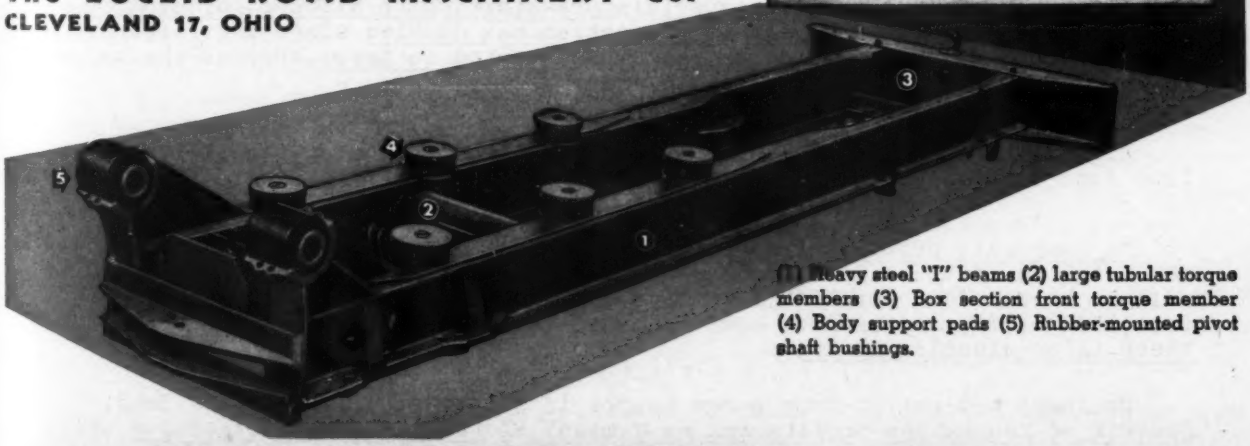
A FRAME OF UNMATCHED STRENGTH

● Hauling equipment used in off-the-highway work must be designed and built to move large loads over difficult haul roads at low cost. It must have rugged "staying power" for the hard usage and varying conditions of mining, construction and quarry operations.

The strong, rigid frame is the backbone of the Rear-Dump Euclid, the hauling unit that has proved its dependable, low cost performance on hundreds of the toughest jobs. Constructed of wide-flanged, deep sectioned "I" beams stiffened by large tubular and box section torque members, the Euclid frame is built to last for the life of the truck. The body is cushioned on large rubber support pads which absorb the heavy impacts of loading and hauling over rough roads . . . there is no metal to metal contact between the body and frame.

Ask your Distributor to show you how all Euclid models, Rear-Dump and Bottom-Dump, are built *throughout* for long lasting, efficient off-the-highway service.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO



(1) Heavy steel "I" beams (2) large tubular torque members (3) Box section front torque member (4) Body support pads (5) Rubber-mounted pivot shaft bushings.

EUCLIDS

Generally Speaking

August 1, 1946

Dear Reader:

With all the current talk about guaranteed-wage plans, such a plan cannot safely be adopted for employes if the plan would reduce their overtime pay or reduce their regular pay rate below the legal minimum. In a case before a federal district court, such a condition was found in violation of the Wage-Hour Act.

* * * * * * * * * * *

To give some idea of the proportions of inflationary trends, the basic cost of industrial buildings has advanced 11 points to 147 during the second quarter of 1946, according to the Austin Co. index. Wage and hour increases largely accounted for the rise. According to the company, construction schedules frequently stretch out so as to increase job overhead 25 to 50 percent above normal.

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Unfilled orders for concrete masonry units have doubled since the first quarter of 1945, although current output is expected to be substantially greater than that for the fourth quarter of 1945 due to new plant activity.

* * * * * * * * * * *

Silicone oils, war-born product made from silica, may be the answer to a need for an aviation instrument lubricant that will not evaporate in extreme heat and yet still flow in sub-zero stratosphere temperatures. The silicon-oxygen-silicon molecular structure of silicones evidently provides characteristics similar to those of quartz, glass and asbestos - inertness and heat resistance.

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The Warner Co., large producer of aggregates, lime products and ready-mixed concrete, has announced no price changes will be made in the near future, its contribution to the "hold the line policy" adopted by many companies.

* * * * * * * * * * *

Shortages of construction materials are starting to hit the building revival. While new construction in the nation has doubled since the first of the year, the monthly rate of increase has started to taper off, as the volume approached a high of $921 million in June.

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Allotments have been made for the second $500 million of the $1-1/2 billion fund authorized by the Federal-Aid Highway Act of 1944.

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No immediate promise of a reduction in taxes is on the horizon, but Chairman Doughton of the House Ways and Means Committee believes the Federal budget will be balanced in the 1947 fiscal year. Any appreciable tax reduction before 1947 is frowned upon by some Congressmen. There could be another reason: there is an election in 1948.

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Business may get it from a new source if OPA is finally declared dead. Renewal of the excess profits tax as a means of counter-acting excessive price advances is being proposed to the Treasury and the White House.

* * * * * * * * * * *

Congress has appropriated $308,845,250 for the Civil Works program of the Army Engineers for the 1947 fiscal year. Some $110 million will be spent on Rivers and Harbors Projects and $194 million for general flood control.

(Continued on page 67)

MACHINERY FOR
CEMENT—LIME—ORES

F. L. SMIDTH & CO. Manufacture the Following Complete Line of Modern Machinery for Cement, Lime and Allied Materials, the Sintering of Ores, etc.

UNIDAN multi-compartment grinding mill.
UNIKOM multi-compartment grinding mill.
KOMINUTER for wet and dry grinding.
BALLMILL for granulating.
TUBEMILL for wet and dry pulverizing.
TRIX for grading wet granulated material.
TIRAX MILL for drying and grinding.
ATOX, air swept, vertical shaft pulverizer.
PYRATOR for drying and grinding.
SPRAY CASINGS for pulverizers.
CYLPEBS metallic grinding bodies.
DRAGPEB metal lining for pulverizers.
SILEX flint liners for pulverizers.
AIR SEPARATORS and Cyclones.
AGITATORS for mixing and storing wet mix.
AIR DISTRIBUTORS for slurry tanks.
WASHMILL for disintegrating and mixing materials in water.

ROTARY KILNS for cement, lime, ores, etc.
UNAX KILNS, with integral cooler.
SUCTION GRATE ROTARY KILN.
ROTARY KILNS—Sintering and roasting.
PRE-HEATERS for rotary kilns.
UNAX COOLERS, cooling drums on kiln.
UNAX GRATE COOLER, air quenching.
UNAX PRE-COOLER.
F.L.S. MULTI-TUBE ROTARY COOLER.
F.L.S. INCLINED GRATE COOLER.
COOLERS, Cement, Ores, etc.
CHAIN SYSTEM for wet kilns.
HEAT EXCHANGERS for dry kilns.
KILN CONTROL, electrical.
GAS ANALYZER, electrical.
KILN EQUIPMENT, fans, hoods, dampers, spouts, airseals, dust chambers, multiple gas discharge.

FLUXO PACKER for filling bags.
EXBINER for discharging bulk cement.
EXTRACTORS, cement from silos.
SKIPULTER shaker conveyor.
CYLCUP distributing conveyor.
PNEUMATIC FEEDERS.
SLURRY FEEDERS for kilns and mills.
CRADLE FEEDERS for coal, rock, clinker.
TABLE FEEDERS for coal, rock, clinker.
COAL FEEDERS for rotary kilns.
COAL BURNERS for rotary kilns.
GAS BURNERS for rotary kilns.
OIL BURNING EQUIPMENT for kilns.
SYMETRO Drive, speed reduction units.
PUMPS for heavy liquids as cement slurry.
FLOURMETER for determining micron sizes in finely ground cement, etc.

F. L. SMIDTH & CO., incorporated in the United States in 1895, are engineer specialists in the design and manufacture of calcining and grinding machinery used for cement, lime, ores, etc.

Having a fully equipped laboratory, manned by experienced engineers and chemists, physical and chemical tests can be made on the material to be handled to determine the suitable machine in each individual case.

They are not limited to any particular type, but have machines to suit every condition such as slow speed or high speed, wet or dry, open or closed circuit, air-swept, combined drying and grinding, single stage grinding, multi-compartment mills; and kilns adaptable for calcining, sintering, nodulizing, desulphurizing, oxidizing and reducing roasting; and, in addition, much auxiliary equipment.

While the grinding mills have long been used in many industries, the rotary kiln was formerly used principally in the cement industry, but the specially designed Smidth kilns, due to their high efficiency, are now also playing an important part in the making of magnesium, manganese, aluminum, dolomite, alkali, nickel, lime, iron, tin, etc.

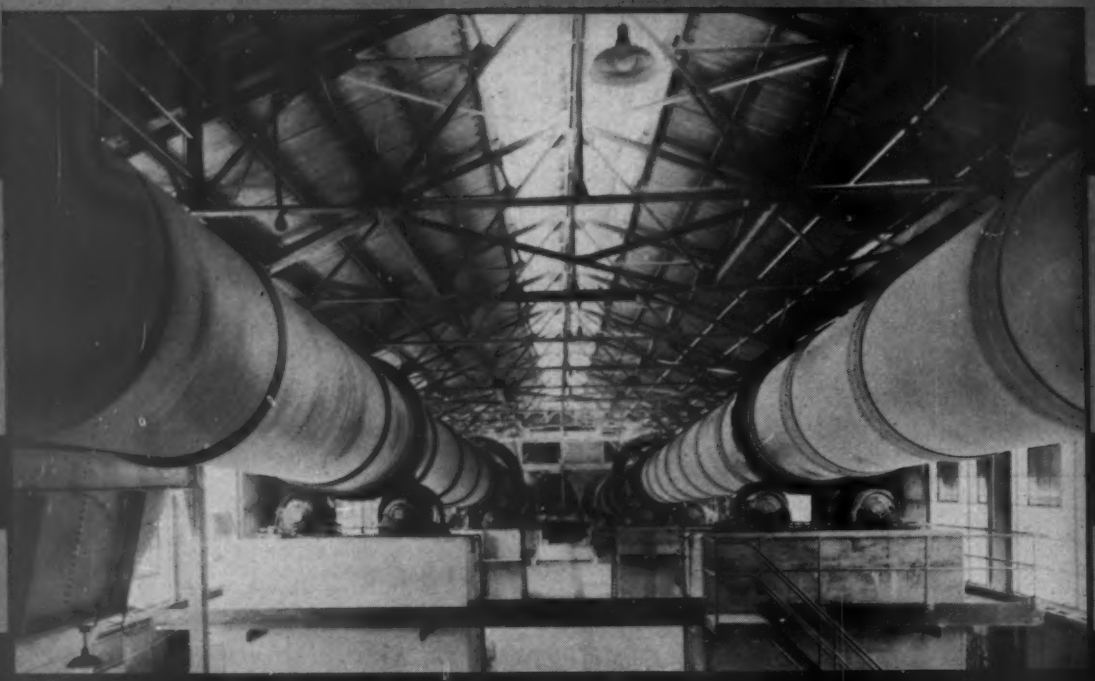
Smidth machinery has been supplied to about 70 different countries of the world, numbering thousands of machines.

The F. L. Smidth & Co. organization maintains a large staff of experienced engineers and can offer extensive engineering services either in connection with the sale of machinery or as separate engineering contracts according to the clients' needs.

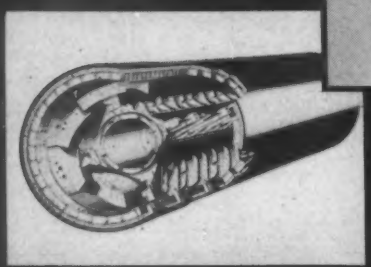
F. L. SMIDTH & CO.

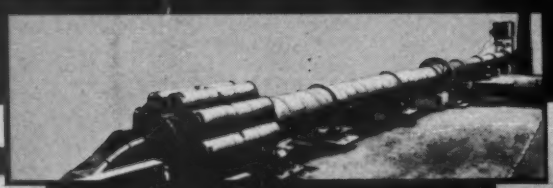
11 WEST 42ND STREET ENGINEERS NEW YORK, N. Y.

UNAX ROTARY KILNS



HEAT EXCHANGERS





CHAIN SYSTEMS

SAVE FUEL

The UNAX KILN operates with low fuel consumption, producing a product of high quality and uniformity.

The UNAX COOLER is integral with the kiln, providing efficient cooling by means of the air for combustion, which in turn is preheated to a high degree thus saving fuel in the kiln.

The Chain System in the wet kiln and the heat exchangers in the dry kiln provide additional substantial fuel savings.

If you are burning lime or lime sludge, etc., write for information to determine the savings possible in your fuel consumption, thus reducing your manufacturing costs.

F. L. SMIDTH & CO.

11 WEST 42ND STREET — ENGINEERS AND MACHINERY MANUFACTURERS — NEW YORK, N. Y.

(Continued from page 64)

According to Wilson W. Wyatt, Administrator of the National Housing Agency, the total number of dwelling units started in the first five months of this year under the Veterans Emergency Housing Program is nearly equal to all home construction during the previous two years.

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Gypsum board shipments are running some 13 percent behind 1946 anticipated consumption, says the Department of Commerce.

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Bids have been called for on the construction of Mary's Lake and Estes power plants by the Chief Engineer's office of the Bureau of Reclamation in Denver, Colo. This is part of the development of the hydro-electric power resources of the Colorado-Big Thompson reclamation project. Reinforced concrete construction will be used.

* * * * * * * * * * *

Wage increases in the steel industry are resulting in changes in the marketing pattern for that industry. Mills no longer desire to sell in distant markets which, under the basing point system, require freight absorption. The industry is being advised to concentrate on markets that may be served most economically, so that prices will remain competitive to "substitute" metals.

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The American Institute of Local Highway Administration, organized at the last convention of the American Road Builders' Association, recently held a three-day session. This organization represents local rural highway officials of the nation.

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The War Department has announced that Garrison Dam Engineer District has been created by Lt. Gen. Raymond A. Wheeler, Chief of Engineers. Contracts for preliminary work on Garrison Dam, destined to be the largest rolled-fill dam in the world, have been let. Estimated cost of the structure is $130,000,000.

* * * * * * * * * * *

Bids can now be made to lease certain mineral deposits, and lands containing such deposits, which were developed by the Federal government during World War II. Oil and gas deposits are not included. Regulations have been amended by the General Land Office of the Department of Interior to permit these leases.

* * * * * * * * * * *

Concrete masonry producers should be encouraged by the fact progress is being made in the apprenticeship training program, aimed at preventing a serious manpower bottleneck to the Veterans Emergency Housing Program. Unions, building contractors and the Department of Labor are tackling the problem. In one month's time, March to April, apprentices in the trowel trades had increased by 20 percent.

* * * * * * * * * * *

Opinions of government agencies indicate that volume of new construction may reach 8.9 billion dollars in 1946 and 13.4 billion dollars in 1947. The March figure for privately financed residential building probably was the highest for any March figures since the 1920 boom years. Still, it falls short of the monthly average needed to provide the volume of housing to fill the Wyatt program.

THE EDITORS

Going Up?

SURE, you can *walk* up, if you like. But you'll get there *faster* and *easier* by modern methods.

That goes for *bulk materials*, too. They can be carried up—or down—by costly, old-fashioned methods. Or you can move them *faster, easier* and *cheaper* by a modern Robins Conveyor System.

That's because Robins Conveyor Systems are "Job-Engineered"—built to fit the specific requirements of your particular job. And that's why operators the country over depend on Robins Conveyor Systems to help speed materials handling operations . . . with efficiency and economy!

So why not call in a Robins "Job-Engineer" to help solve *your* materials handling problem? A note or call will bring him to your desk for consultation. Of course, there's no cost or obligation for this service.

America's Only COMPLETE Materials Handling Service

ROBINS

CONVEYORS INCORPORATED
PASSAIC, NEW JERSEY
DIVISION OF HEWITT-ROBINS INCORPORATED

Hewitt and Robins unite to offer you 136 years of combined experience in "Job-Engineered" rubber products and machinery designed best to answer any materials handling problem you may have.

★ ★ ★ Editor's Page

Competition Through Plant Rehabilitation

WHATEVER comes of the portland cement industry's appeal to set aside the Cease and Desist Order (1942) of the Federal Trade Commission, and its legal battle with the Department of Justice on almost identical charges (that the industry has been guilty of a combination or conspiracy to restrain competition through its pricing policies) the industry, as such, and individual member companies have presented a thorough defense. Briefs filed by the Marquette Cement Manufacturing Co. on appeal from the F.T.C. order, as an instance, have established a strong case for the company, and the industry, in support of an unprejudiced judgment.

Despite exoneration of the industry on the same charges by the U. S. Supreme Court in 1924, and that Court's opinion that uniformity of prices confirmed the existence of competitive forces, the industry continues to be belabored at great financial cost really because identical prices have been bid on government contracts. It constitutes persecution in a determined effort to destroy long traditional delivered price quotations. It is alleged that delivered pricing results in monopolistic practices that stabilize prices sometimes at non-competitive levels, and that the industry employs all kinds of illegal devices that stifle competition.

It is hard to reconcile the charges with the fact, as expressed in this issue of ROCK PRODUCTS, that cement companies have not changed their plans, as expressed to the editors over a year ago, to spend millions of dollars for plant rebuilding and rehabilitation, notwithstanding operating losses incurred by a number of those concerns in 1945. There can be only one real purpose why an industry has provided 100 million dollars for that use—to meet competition. Individual companies constantly are trying to surpass each other in plant operating efficiency, and for the purpose of establishing price levels that will be effective in meeting competition from other building materials. True monopolistic practices would have a pronounced tendency to retard such projected progress and there would not be much incentive for new capital investment.

Substitution of an f.o.b. mill price system, which may become necessary, would have a tendency to remove competition from the field, except if new distribution facilities prove the answer. Distant mills would be compelled to withdraw from competition in a given area, or for a specific project, in favor of local mills, probably leading to further company consolidations. The industry happens to be one of widely-fluctuating extremes in volume of business. A mill in any area without real competition, brought about because of differentials in freight rates, need only peg mill prices at a figure just low enough so that the long haul shipper cannot absorb sufficient of the freight charges to compete.

The industry never has shipped in any year more than 70 percent of its capacity to produce and, generally, is out to sell all the cement it can. Lead prices (delivered) established by low cost mills inevitably would lead to uniform prices in bidding, meaning that the efficiency of less favorably located mills will determine how much freight can be absorbed.

The industry has another form of competition, price competition in fact, in the degree of technical service rendered to aid customers in placing good concrete.

Plant Productivity Is Objective

According to the annual stockholders' report of Lehigh Portland Cement Co., average hourly wages to be paid by the company in 1946 will more than double those paid in 1926. Prices in 1946 are practically identical to those charged in 1926, and today's product has many more elements of cost included. With labor costs in the neighborhood of one-third of net sales for the industry, only intelligent management and great technological progress could have held overall costs down.

The industry has given evidence in this issue that it accepts the challenge of high costs and intends to take steps for a high degree of labor productivity through capital investment in order to offset wage increases. Increased operating efficiency, permitting payment of wage increases, is the only way prices can be held down. The goal is substantial reduction in man-hours per barrel plus vastly improved products.

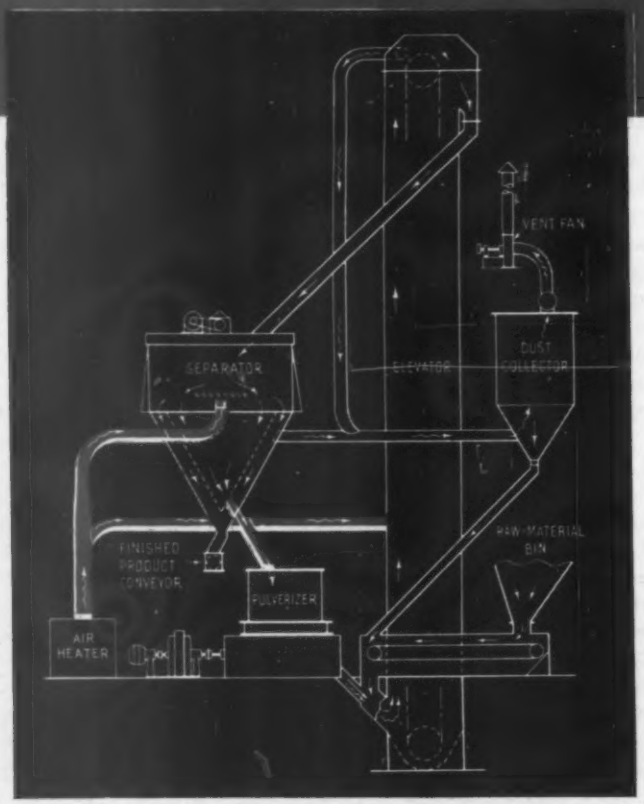
Pre-war concepts of maximum efficiency to meet competition will no longer suffice, and the companies are going to plow back into plants great sums of money in an effort to keep pace with the rising spiral of wages, high fuel rates and power costs. The industry is counting on improved equipment design and better operating methods throughout to accomplish more favorable operating costs. Low profits, and losses suffered under O.P.A. price limitations, have served to focus critical attention on operating departments that hitherto had been considered efficient.

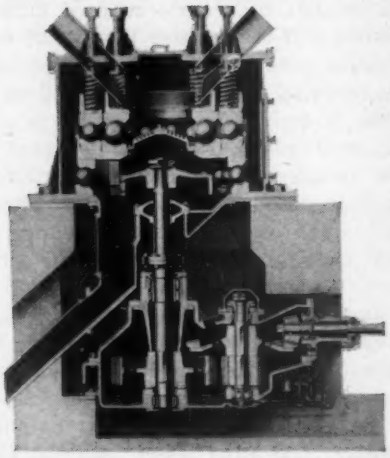
We may anticipate great interest in long kilns, refractories and other fuel conservation devices, dust collection, clinker cooling, power plants, quarry haulage, kiln firing methods and instrument controls, to mention a few of the more outstanding types of installations to be made in existing mills.

Bror Nordberg

DRYING AND GRINDING...

in ONE operation with the B & W Closed-Circuit System





- Eliminates separate drying equipment
- Reduces cost of kiln feed
- Substantial circulating load assures a well-blended product.

The Ball Bearing Principle of Grinding in the B&W Type B Pulverizer makes these advantages possible.

Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
85 LIBERTY STREET, NEW YORK 6, N.Y.

C-65

Rocky's NOTES

Nathan C. Rockwood

Manufacturing vs. Product Research

OBVIOUSLY, THERE ARE at least two kinds of research a producer, or a group of producers, may engage in for industrial gain or profit. By far the commonest kind of research as done by coöperative associations is product research. Where a product may be standardized to the extent of meeting a common specification, this product research offers the best possible medium for coöperative publicity and advertising. It is a means of bringing producer or manufacturer and user or consumer together on common ground.

Product Research

Product research also has the advantage of interesting many independent investigators and experimenters, all anxious to contribute their bit to the general knowledge about the product and its uses. There is disadvantage as well as advantage in this, because it leads to publication of half-baked theories and "conclusions" which often tend to muddle the problems involved rather than solve them; but to believers in the kind of publicity that places a value on any mention whatsoever of a product, it is supposed to help the cause, whether the mention is favorable or unfavorable to the product.

The cement, concrete aggregates and concrete construction industries are fine examples of long continued and promiscuous product research. That, on the whole, this research and resulting publicity have greatly increased the use of concrete in construction, no one can doubt. Probably more space has been devoted to these materials in the literature on construction materials and construction methods in the last 50 years than to any other construction material. Yet, a birdseye view of the whole range of literature must leave the philosophic-minded researcher with the impression that the most conspicuous point made in all this literature is to the effect of a user dealing with a material for which certain desirable results can never be predicted with certainty.

There are still so many variable and unpredictable factors between the raw materials in quarry and pit and in the completed wall or pavement slab that hoped-for results are not always there. The first problem of researchers was naturally to try to run down some of these variables and to establish practices to overcome them, so far as humanly possible. This involves chemical, physical and mineralogical researches into the nature of the materials, which have been going on for a generation or more, and doubtless will continue to be carried on indefinitely into the future. Thus a very great deal has been and probably will still be learned about the products, and the field construction practices in connection with the products.

Manufacturing Research

Individual producers and manufacturers, if they have made all possible use of this accumulation of product research data, have used it in their own plant or manufacturing research. To investigate portland cement clinker, for example, to find out what it is composed of, and what mineral combinations are most desirable, is one thing; to take these data and apply them to the processing in a kiln in a manufacturing plant is quite another thing, and one that ordinarily would be considered outside the scope of a coöperative research organization. The reason of course is that jealous manufacturers would be apt to look upon such assistance to an individual manufacturer as against their interests as competitors, even if they themselves were entitled to the same assistance, when it came their turn. There was once resistance on the part of producers and manufacturers to all coöperative research on similar grounds, but education and experience have proved the fallacy of such opposition.

Large and small differences in portland cements from various manufacturers, or from the same manufacturer at the same or different plants, are usually accounted for as caused by slight differences in raw materials, or the effects of the scarcer minerals in small amounts. That differences in raw materials are important, as portland cement is now made, seems to be beyond question. Even different mineralogical forms of silica and alumina are known to have different degrees of chemical activity, and hence probably react differently, at different temperatures, or different time periods, with the calcium oxide or carbonate in a rotary kiln.

However, it seems open to question whether the end product—the portland cement clinker—differs any more on account of the mineral compositions of the raw materials than on account of the different heat treatments it gets in kilns of various sizes, slopes and speeds. So far as we can find out there has been but one formula used in operating a rotary kiln to make portland cement clinker. That is to burn as much fuel as is practicable without destroying the kiln lining too rapidly, and to push as much raw material through the kiln as will come out a satisfactory clinker, based more on physical than chemical tests.

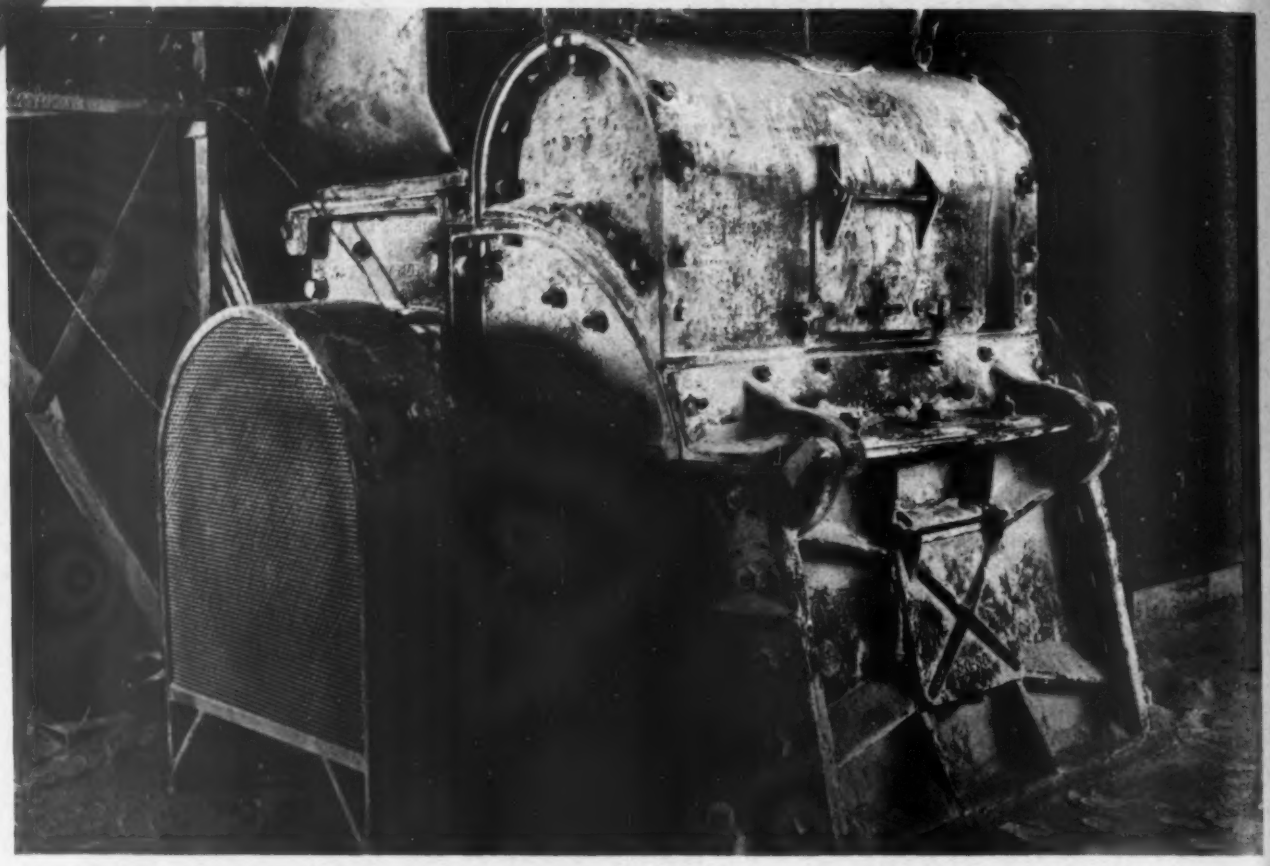
If a kiln is relatively short, the transition from raw materials to clinker takes place rapidly; if the kiln is relatively long, the transition takes place much more slowly. With a standard kiln slope of ½ in. per ft., and the same number of kiln revolutions per minute or per hour, the time spent by the materials in the kiln is directly proportional to its length. There must be an important relationship between kiln diameter and speed, or there must be a relationship between the peripheral speed of the inside of the kiln, and the proper turnover of its segmental load of material, which is best suited to mixing or blending the raw materials, and to exposing them most effectively to the heat in the kiln. These factors should be capable of analysis—methematical and chemical.

Increase Chemical Efficiency

We know a great deal about heat balances of rotary kilns, and we have profited much from application of various devices to improve kiln thermal efficiencies. So far as we know very little attention has been paid to increasing the chemical efficiencies of kilns; and we don't see how this can be done unless manufacturers are willing to gather and make available a great deal of more or less confidential operating data, which probably will have to be specially compiled and studied independently for this particular purpose.

The same opportunity exists for production and manufacturing research in all the rock products industries. It does not mean, necessarily, that a plant must be operated as an experimental laboratory; it does mean critical observation of regular operating practices, gathering of much data, and study and intelligent analysis of the data for more light on the underlying fundamentals.

Gruendler 6XC Hammermill Marquette Choice



300 TPH—MINIMUM MAINTENANCE—300 HP MOTOR
This is the 5 year record of the Gruendler 6XC at the Marquette Cement plant, Des Moines, Iowa. Two other Gruendler 6XC's do the crushing job at the Marquette Oglesby plant.

When the Marquette Cement plant, Des Moines, Ia., was modernized 5 years ago, the Gruendler 6XC Hammermill was selected to replace two old hammermills in turning out 250 t.p.h. minus ¾ inch material.

The Gruendler hammermill, using the free swinging hammer principle, is continuing to do an outstanding job today, turning out up to 300 tons of perfectly-sized material per hour, although its rated capacity is only 250 t.p.h.

Whether your crushing needs are large or small, whether you make cement, agstone, road rock or crushed gravel, there's a Gruendler, job-proven crusher which will give you better crushing results.

Gruendler Hammermills

- **Reduce stone passing feed opening to agstone or roadstone in one operation.**
- **Uniform cubical product.**
- **5 to 500 t.p.h.**
- **20 sizes with up to 36-inch feed opening.**

Gruendler also makes these Gruendler products—jaw crushers, roll crushers, feeders, screens, bins, bin gates, conveyors, portable and stationary plants for the crushed stone, agstone, cement, sand and gravel and miscellaneous mineral industries.

Write for Catalogue 800.

GRUENDLER CRUSHER & PULVERIZER CO.
PLANT AND GENERAL OFFICES, 2915-19 NORTH MARKET STREETS • • SAINT LOUIS 6, MISSOURI

Washington NEWS

Out of the welter of confusion which President Truman's veto of the first O.P.A. bill left in its wake, Congress finally came up with a compromise bill that has many of the same provisions as the first bill. The new law, signed "reluctantly" by the President, provides that prices for manufacturers, producers, processors, service and transportation industries must be high enough to return on the average the 1940 price, plus any cost increases since then. Rent controls were restored. Price ceilings on meats, dairy products, grains, cottonseed, soybeans, and food and feed products were given a 30-day period free of control until August 20 when the three-man control board will pass on the necessity for continuing price ceilings on these products. The Control Board has been set up as a final appeal board to determine when and how individual products or industries shall be de-controlled if the O.P.A. does not act. O.P.A. will be continued until June 30, 1947.

Approve Agstone Appropriation

President Truman recently signed the appropriation bill for the United States Department of Agriculture for the fiscal year ending June 30, 1947. In this bill, the Production and Marketing Administration receives for "conservation and use of agricultural land resources" $301,746,000 for its usual program, including the "purchase of seeds, fertilizers, lime, trees, or any farming materials, or any soil terracing services, . . ." The bill also authorizes the formulation of 1947 programs amounting to $300,000,000, indicating that Congress will appropriate at least this amount for soil-building and soil-and-water-conserving practices for next year.

HH Ratings for Concrete Block

On June 26, the Civilian Production Administration issued an amendment to Priorities Regulation 33, Direction 7, which provides for assignment to builders of HH preference ratings to secure materials listed on Schedule A of that regulation, which are required for use in the Veterans' Emergency Housing Program.

Under this amendment producers are required to ship 60 percent of production against HH orders. A producer must accept and fill rated orders (AAA, MM, CC and HH) for concrete block in accordance with the provisions of Priorities Regulation 1. He must accept during any calendar month, in preference to all other rated orders, except AAA, all HH rated orders which he receives before the 20th day of the month calling for shipment during that month up to 60 percent of his scheduled production of concrete blocks for that month. No producer, however, is required to accept HH rated orders for more than this percentage of his production of concrete blocks in any month. This direction does not require any set-aside of concrete blocks, by a producer.

If an HH rated order is received after the 20th day of the month in which shipment is required, or if at least 60 percent of that month's scheduled production has been shipped or is scheduled for shipment on HH orders, then the producer need not accept the HH order. But he must promptly notify his customer telling him approximately when he could make the shipment, based on the requirement of the above paragraph.

(e) *Producers and dealers may refuse HH orders from purchasers outside their areas.* A producer or dealer may refuse to accept an order for concrete blocks bearing an HH rating offered to him for use on Veterans' Emergency Housing projects in any area to which he has not delivered concrete blocks bearing an HH rating in the five years preceding receipt of that order. A new producer or dealer may not apply this basis for refusal to accept HH rated orders for use in his local trading area.

(f) *Dealers' handling of HH rated orders.* A dealer must accept and fill rated orders (AAA, MM, CC and HH) for concrete blocks in accordance with Priorities Regulation 1. However, if he receives a supply of concrete blocks for which he did not extend ratings and if he places that supply in his yard inventory, he need not use more than 20 percent of that supply to fill HH rated orders. HH ratings on orders filled from that supply must not be extended by the dealer to get replacements.

(g) *Exclusive sales arrangements.* A producer who has an arrangement, made before June 26, 1946, for the sale of all, or substantially all, of his production of concrete blocks to a single dealer, may sell pursuant to that arrangement and without regard to paragraph (d) of this direction. However, in such a case, the dealer becomes subject to the producers' provisions in this direction, just as if he were a producer.

Increased Freight Rates

The Interstate Commerce Commission has granted approval to the railroads, effective July 1, to file on three days' notice tariffs increasing freight rates on sand and gravel, crushed stone and slag by three percent throughout the country, with an additional 5 percent in Official Classification territory or approximately 8.15 percent for that territory. The latter territory comprises the area east of the Mississippi and north of the Ohio rivers. Carriers also are authorized to increase cement rates by 6 percent nationwide with an increase of an additional 5 percent in Official Classification territory. Industrial sand producers will pay 6 percent throughout the country, with an additional 5 percent in Official Classification territory, which approximates 11.3 percent.

However, a dilemma is faced by producers of agricultural limestone who wish to pass on the increased freight rate on "a source of supply" contract with the Production and Marketing Administration of the Department of Agriculture. Practically all agricultural limestone is being sold through this channel. The Agricultural Limestone Division of the National Crushed Stone Association inquired through the Department of Agriculture concerning the passing on of this increase in freight rates to buyers under these contracts and was informed that the Office of the Comptroller General will not permit a government agency to pay a price higher than the price stipulated in contract.

Under this ruling, the rail-shipping seller has the choice of one of two procedures; he may elect either to absorb the increased freight or cancel his contract. As pointed out by Henrey A. Huschke, managing director of the Agricultural Limestone Division, either course of action may yield an undesirable result. To absorb freight will result in lower earnings. If a substantial number of contracts are cancelled in any state or area and the government decides to readvertise for bids, there is a possibility, because of new low bids, that the distribution pattern may be changed. The situation is reported to be especially acute in the Northeast region where bids for 1947 deliveries were opened on June 11 (prior to the freight increase) and awards are being made.

Administration Building, McLaughlin Field, Hot Springs, Arkansas. Architects, Erhart, Eichenbaum and Rauch, Little Rock; contractors, Peterson & McFadyen, Little Rock; ready-mixed concrete furnished by C. J. Horner Co., Hot Springs.

FOR THIS HEART OF AN AIRPORT

Better Concrete . . . At No Extra Cost with Duraplastic Air-Entraining Cement

INTO THIS modern structure went 1,000 cubic yards of ready-mixed concrete made with Atlas Duraplastic. The characteristics of this air-entraining portland cement were reported as follows:

1. **Less water was required to make a workable mix.**
2. **Bleeding and segregation were greatly reduced.**
3. **Less vibration was required for proper placement.**
4. **Surfaces were free from "honeycomb" and sand streaks.**

Atlas Duraplastic cement complies with ASTM specifications. It provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance. It sells at the same price as regular cement. For further information, write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Dayton, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

RP-D-38

ATLAS DURAPLASTIC

TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

Makes Better Concrete at No Extra Cost

U. S. STEEL RADIO SHOW—*Sunday Evenings—Consult local newspaper for time and station*

A UNIVERSAL ATLAS PRODUCT

the *Personal Side* of the news

Technical Director

ARTHUR D. MACNUTT, who in 1941 joined the Minnesota Mining and Manufacturing Co., St. Paul, Minn., as an engineer on color and research in the production of color-fast cer-

Arthur D. MacNutt

amic granules for surfacing asphalt roofing and siding, has been appointed technical director of the roofing granule division.

Latin American Visitors

PAUL B. REINHOLD, president of the Atlas Equipment Corporation and first vice-president of the American Road Builders' Association, was toastmaster at a recent dinner in Pittsburgh in honor of 22 Latin American highway engineers who are in the United States for a year's training in highway construction and maintenance. This is a joint government and American Road Builders Association program.

Ideal Cement Changes

J. C. ANDREWS, superintendent at the Superior, Nebr., plant of the Ideal Cement Co., Denver, Colo., has been promoted to division superintendent with headquarters in Denver. GAYLE N. DAVIS, who was plant engineer at Superior, will succeed Mr. Andrews as superintendent. MAXEY COBB, research chemist in the general laboratory, has been named acting chief chemist at Portland, Colo. HASKELL RODGERS, chief chemist at Portland, Colo., has been appointed chief chemist at Mobile, Ala. DAN MORSE, recently returned from the Army, and formerly at Houston, Texas, has been appointed assistant to the general superintendent with headquarters in Denver. H. B. BOLTON, sales manager at Houston, has been transferred to Mobile, Ala., as sales manager. CLYDE M. BATES, formerly assistant sales manager at Houston, will succeed Mr. Bolton as sales manager. WALLACE J. HUNTER, as sales manager at Omaha, Nebr., will assume the responsibility for that office upon the resignation of L. J. HOENIG, general manager, who has been with the company for more than 30 years. R. E. MARSH has been promoted from design engineer in the Denver office to project engineer at Mobile, Ala. CARROLL NORDEAN, chief clerk at Okay, Ark., has been transferred to Mobile, Ala., in the same capacity.

Traveling Director

HOWARD F. PECKWORTH, managing director of the American Concrete Pipe Association, Chicago, Ill., has announced that during the period between June 20 and September 1, 1946, he will travel over the country visiting concrete pipe manufacturers and attending regional meetings. His tentative schedule is as follows: June 20-26, Washington, D. C.; July 13-22, Seattle, Spokane and inbetween in State of Washington; July 27 to Aug. 3, Southern California; August 10-23, Dallas, Austin, San Antonio, Houston, New Orleans and Memphis; August 28 to September 1, Albany, N. Y. The Executive Committee meeting will be held in the DeWitt Clinton Hotel in Albany, N. Y., at 10 a.m. Friday, August 30, 1946.

Change Name

IN THE MAY issue of ROCK PRODUCTS, p. 54, there appeared a "News About People" item concerning Mrs. Edith T. Sisler, owner of the Standard Cast Stone Corp., Harrisonburg, Va. This company now operates under the name of Sisler Concrete Block Works.

Moves to Georgia

JOHN C. SPRAGUE, engineer-in-charge of the Division Materials Testing Laboratory, South Atlantic Division, Corps of Engineers, U. S. Army, has moved from Jacksonville, Fla., to Marietta, Ga., the new headquarters of the laboratory. Prior to his connection with the Corps of Engineers, Mr. Sprague was development engineer with Dravo Corp., Pittsburgh, Penn.

Field Engineer

HAROLD F. FOLEY, who for the past 16 years was employed in miscellaneous engineering work for the government, has been appointed field engineer for the southwest Kansas territory of the Portland Cement Association, with headquarters in Wichita, Kans. E. J. MUELLER, who was located in Wichita from 1932 to 1937 as field engineer, has been with the Association 18 years. After leaving Wichita he was at Topeka and Tulsa and was transferred to Kansas City, Mo., just a short time ago.

New Turner Officials

ROY N. MCCANDLESS has been appointed president of The Turner Gravel Co., San Antonio, Texas. E. M. MCCANDLESS has been named vice-president; L. MAURICE MCCANDLESS, secretary and treasurer; ALFRED B. LANFORD, general manager; and CLYDE B. LANFORD, plant superintendent.

Association Officers

FRED M. KETTENRING, president of Graystone Concrete Products Co., Seattle, Wash., was elected president of the Concrete Pipe and Products Association at the recent meeting of the Association. W. S. WILSON, president of Graystone Materials Co., Olympia, Wash., was elected vice-president; and J. R. SHERMAN of Yakima, secretary-treasurer.

Left to right: Fred Kettenring; Mr. and Mrs. Homer Bergren; Mrs. W. S. Wilson; Whitney, Jr.; and W. S. Wilson

Joins Manufacturers

MILLARD R. WARREN, general superintendent of the Southern Cast Stone Co., Knoxville, Tenn., has been appointed vice-president and consulting engineer of Roy Darden Industries, Inc., Atlanta, Ga. Mr. Warren has been connected with the concrete products industry for the past 20 years, and was the originator of the pneumatic pick-up yard hoist described in ROCK PRODUCTS, June, 1945, pp. 66 and 125. J. W. Warren, his father, is vice-president of the cast stone company.

Millard Warren

New Block Producer

HARRY G. HOY, formerly associated with Hawkeye Portland Cement Co. and the Marquette Cement Manufacturing Co., Des Moines, Iowa, as a control chemist, has started a concrete block plant in West Des Moines, Iowa, known as the Hoy Concrete Block Co.

Assistant Engineer

CHARLES A. MAYER has been appointed assistant engineer in the New York office of The Asphalt Institute, to act in the capacity of an administrative engineering assistant to Bernard E. Gray, general manager and chief engineer.

N.H.A. Director

HAROLD D. HAUF, architect and engineer, has been appointed director of the technical branch of the National Housing Agency. The technical branch, which has just been reorganized, will encourage the development of new materials and new methods of construction for the Veterans Emergency Housing Program. Mr. Hauf formerly worked under Rear Admiral Kirby Smith, who was director of the Construction Division of the Bureau of Yards and Docks and who is now Deputy General Expediter of the National Housing Agency. Howard Vermilya, who is from the John B. Pierce Foundation as a special consultant, will continue as a consultant to the technical branch.

Resigns from P.C.A.

S. CARL SMITHWICK, district engineer of the Spokane, Wash., office of the Portland Cement Association for the last 15 years, has resigned his position to devote full time to the Smithwick Concrete Products Co., Portland, Ore., which he has founded. R. P. NEWLAND, who recently joined the Spokane office as Mr. Smithwick's assistant, will succeed him as district engineer. In his capacity as district engineer Mr. Smithwick acted as consultant in reclamation and highway construction work in eastern Washington and northern Idaho, and worked closely with the engineering and architectural departments of Washington State College and the University of Idaho. His new plant will have a capacity of 10,000 block per day, and is said to be one of the largest and most modern of its kind on the Pacific Coast.

Back on Job

FRANK CROWLEY, who was manager of the Portsmouth, N. H., plant of the National Gypsum Co., Buffalo, N. Y., before the Navy took over the plant to manufacture submarine conning towers, is back on the job, together with the foremen and many former employees, 18 of whom are veterans.

Gypsum Appointments

R. L. KILGORE, superintendent of the Dover, N. J., plant of the National Gypsum Co., Buffalo, N. Y., has been made manager of the Alexandria, Ind., plant. Mr. Kilgore started with the company over 20 years ago as cupola operator at Alexandria and subsequently became foreman, superintendent and manager. S. M. FISHER, superintendent at the Dubuque, Iowa, plant has been appointed to succeed Mr. Kilgore as manager at Dover, N. J. Mr. Fisher has had more than 20 years' experience in rock wool manufacture and started out as mechanic, progressing to chief engineer, superintendent and plant manager. D. W. BURNETT, superintendent at the Alexandria, Ind., plant, has been named process engineer and will work under the direction of D. D. Crandell, vice-president in charge of research.

At Rector Canyon Dam Ceremony

ROBERT MITCHELL, president of Consolidated Rock Products Co., Los Angeles, Calif., was one of the speakers at the ceremonies celebrating the start of construction of Rector Canyon Dam in Napa County, Calif., which will provide water for four State institutions — the Veterans Home at Yountville, Napa State Hospital, the State Farm, and the State Game Farm. Mr. Mitchell is chairman of the Buildings and Grounds Committee of the Veterans Home board of directors.

Kaiser Export Sales

WILLIAM F. PELLETIER has been named to head the New York office of Kaiser Export Sales, representing industrial interests of Henry J. Kaiser. He will report to W. J. Gleason, sales manager.

Veteran Returns

FLOYD MILLEN, superintendent of the new limestone plant of the Farmington Gravel Co., Bonaparte, Iowa, is another of the many veterans returning to the industry. Mr. Millen, released from service in February, 1946, served four years as a Lieutenant in the Army Engineer Corps, spending considerable time in the Philippines.

Left to right: Floyd Millen, superintendent; Fred Anders, office man, of Farmington Gravel Co., Bonaparte, Iowa; and Harold Linge, superintendent of Douds Quarries Co., Douds, Iowa

Elected President

SMITH W. STOREY, president of Consolidated Cement Corp., Chicago, Ill., has been elected to succeed the late John L. Senior as president of Florida Portland Cement Co., Signal Mountain Cement Co., and Trinity Portland Cement Co. No appointment has been made to take the place of Mr. Senior as chairman of the board of Consolidated. Mr. Storey has served as executive vice-president of these companies which have plants in Michigan, Kansas, Florida, Tennessee and Texas. He is a director of the Portland Cement Association and has been active in the cement business for over 20 years. Howard Miller, secretary-treasurer of Consolidated Cement Corp., becomes vice-president and treasurer of the other three companies.

Other company officers are: Consolidated Cement Corp., Stanley G. Stewart, vice-president; Florida Portland Cement Co., F. M. Traynor, vice-president; O. L. Pelham, secretary; B. I. Meyer, assistant secretary and assistant treasurer; and Devereaux Bacon, Jr., assistant secretary; Signal Mountain Portland Cement Co., L. H. Cladwell, vice-president; J. P. Hoskins, secretary and treasurer; J. A. Hilley, assistant secretary and assistant treasurer, and B. I. Meyer, assistant secretary; Trinity Portland Cement Co., R. N. Cowham, vice-president; J. F. Hayden, vice-president; R. T. Gunderson, secretary; B. I. Meyer, assistant secretary; and L. G. Williams, assistant secretary and assistant treasurer.

Sales Manager

FRANK P. HOOVER, assistant sales manager of the Monarch Cement Co., Humboldt, Kans., has been appointed sales manager. Mr. Hoover joined the organization in 1922 in the shipping department and soon became traffic manager, which office he held until March, 1936. At that time he transferred to sales work and for the next three years was junior salesman in the Tulsa, Okla., district office. In 1939 he was promoted to district sales manager of the Wichita, Kans., territory. He has been assistant sales manager since January, 1944.

From Diesels to Quarrying

E. F. HABERKERN has been appointed assistant to the president of Columbia Quarry Co., St. Louis, Mo., according to a recent announcement by President E. J. Krause. Mr. Haberkern is a graduate of Notre Dame University, where he majored in mechanical engineering. He was with the National Supply Co., Superior Engine division, for 12 years, and in later years was in charge of production. It will be recalled by readers of ROCK PRODUCTS that several articles have appeared in recent years describing the increasing use of Diesel-electric power by Columbia Quarry Co. Mr. Haberkern's long experience with Diesel engine power plants will be of great value to the company in completing its power conversion program which is noted in the news columns elsewhere in this issue.

Retires

HANS MUMM, JR., a veteran in the concrete products industry, recently sold his interest in Everett Concrete Products Co., Everett, Wash., and

Mr. and Mrs. Hans Mumm, Jr.

plans to retire. He is shown with Mrs. Mumm at the recent meeting of the Concrete Pipe and Products Association at Alderbrook Inn near Seattle, Wash.

Celotex Appointments

E. C. RAUTENBERG, manager of the Chicago office of The Celotex Corp., has been appointed assistant general sales manager. E. E. DIERKING, manager of the Cleveland office, will succeed Mr. Rautenberg as manager in Chicago. GEORGE J. DINGES, following his release from the Army, has resumed his position as manager of the Atlanta, Ga., branch. He served as Lieut. Colonel in the Headquarters 339th Ordnance Battalion. ALLEN CASSIN, who succeeded Mr. Dinges at Atlanta during the time he was in service, becomes manager of the Cleveland branch.

Heads New Concern

LAWRENCE L. BURGER, president of Alliance Concrete Products, Inc., a new concrete block plant starting operations in Alliance, Ohio, has been admitted to the Ohio State Bar. Mr. Burger practiced law in Detroit, Mich., for seven and one-half years prior to his four years in military service.

OBITUARIES

ALFRED FRANK STOCKWELL, superintendent of the magnesium plant of the New England Lime Co., Canaan, Conn., died at his home recently after a long illness. He was 35 years old. Mr. Stockwell was born in Cobalt, Ontario, Canada, and was graduated from Drury High School and Massachusetts Institute of Technology. He had been with the company since 1936.

JOHN CRAIN, who recently became a partner in the Sawyer Sand and Gravel Co., Holdrege, Nebr., was killed July 9 when a scoop loader he was driving overturned into a ditch. Mr. Crain was secretary of the Chamber of Commerce before he joined the Navy. A few months after he returned from service he resigned to become associated with the sand and gravel company.

VERNON TAYLOR, safety supervisor of California Portland Cement Co., Colton, Calif., died May 13 at his home in Fontana, Calif. He was 56 years of age. Mr. Taylor had been safety supervisor for two and one-half years, during which time the company was awarded the Portland Cement Association safety trophy for operating a full calendar year without a lost-time injury.

MORRIS ALLEN ARNOLD, a director of Superior Portland Cement, Inc., Seattle, Wash., passed away recently. He was 80 years old. At the time of his death Mr. Arnold was also a director and a member of the executive committee of the Seattle-First National Bank. He had retired as chairman of the board in 1940.

SAMUEL M. SHALLCROSS, former general manager of the American Lime and Stone Co., Bellefonte, Penn., a division of the Warner Co., Philadelphia, Penn., died at his home in Chatham, N. J., on June 28 at the age of 53. Mr. Shallcross was a graduate engineer. He was associated with the American Lime and Stone Co. from 1923 to 1942, first as assistant to the general manager and later as general manager. In 1942 he was appointed director of the new research and development department of the Warner Co. More recently he resigned to become an industrial consultant.

EDWARD READER, who with his brother, the late I. A. Reader, operated the Bedford Silica Sand Co., Bedford, Ohio, died recently.

RALPH HEFFNER, president of the Wapak Sand and Gravel Co., Wapakoneta, Ohio, died recently. He was 63 years of age.

news OF THE INDUSTRY

Michigan Cement Men Hold Safety Meeting

ABOUT 50 cement operating and safety officials met at the Petoskey-Bay View Country Club, Petoskey, Mich., recently for a regional safety conference. Petoskey Portland Cement Co. was host to the meeting. A. J. R. Curtis, assistant manager of the Portland Cement Association, conducted a roundtable discussion on accident prevention. George W. John, vice-president and general manager of Petoskey Portland Cement Co., was general chairman of the meeting. Company represented at the meeting in addition to Petoskey, were Peerless Portland Cement Co., Aetna Portland Cement Co., Wolverine Portland Cement Co., Huron Portland Cement Co., and Consolidated Portland Cement Co.

Open Ready Mix Plant

ROCHESTER READY MIX CONCRETE Co., Rochester, Minn., recently opened its new ready mixed concrete batching plant with a capacity of 320 cu. yd. of concrete daily. Glenn F. Thompson, president of the company, has announced that five transit mix trucks will be in service and six other trucks will be operated. Other officers are: D. B. Hunt, vice-president, and John C. Lobb, secretary-treasurer.

Settle Cement Strike

PACIFIC NORTHWEST cement plants are back in production after a 12-day strike. Basis for settlement was a 17½-cent hourly increase, reclassification of job rates, a 4-cent afternoon differential and a 6-cent night differential. Companies involved were Superior Portland Cement Co., Northwestern Portland Cement Co., and Olympic Portland Cement Co.

Ideal's Expansion Program

IDEAL CEMENT Co., Denver, Colo., has entered on an extensive program of expansion and rehabilitation of its plants. In a recent bulletin sent out by the company, Cris Dobbins, vice-president and general manager, pointed out that its mills in Colorado, Utah, and Montana had suffered considerably during the war years for lack of maintenance, due to the unavailability of materials and scarcity of labor. To take care of the tremendously increased post war demand for cement stimulated by the big Bureau of Reclamation program in these three States, the company decided to take steps in the Fall of 1945 to meet this situation. Difficulties were encountered in getting deliveries of new equipment, and the company therefore looked into the possibility of buying defense plant installations from the Federal government.

It was finally decided to buy the sinter plant at Mobile, Ala., which had been built to process low grade aluminum ore. While not laid out exactly as a cement plant would be designed, finish mills, kilns, slurry tanks, conveying equipment and laboratory are available. Two of the kilns will be converted for cement production at Mobile to supply local markets and to relieve shortages of cement in Latin America, and three kilns will be moved to Portland, Colo., and two to Devil's Slide, Utah, along with such other equipment and machinery as is available to complete the installations at these two locations. It is expected that production in Colorado and Utah plants will be nearly doubled when these installations are completed.

The increased production in Montana is being taken care of with new equipment, orders for which were placed more than a year ago and deliveries of which are being effected at the present time. Production in the Montana plant will be increased about 30 percent.

Virginia Stone Producers Organize

PRODUCERS of agricultural limestone in Virginia met on June 19, and decided to organize a State association. A committee consisting of F. Grove White of the M. J. Grove Lime Co., E. I. Williams of the Riverton Lime and Stone Co., and O. M. Stull of the Liberty Limestone Corporation was appointed to draft by-laws and formulate organization plans and procedures.

Gypsum Paper Subsidy

ONE of the bottlenecks restricting the production of gypsum board is paper liner. To stimulate production, the National Housing Agency recently announced a $40 a ton incentive premium would be paid for production of gypsum board paper liner in excess of specific quotas. The government is hopeful that the premium will increase July production of paper liner by 4500 tons or enough for 20,000 additional houses.

To Build Lime Plant

KELLEY ISLAND LIME AND TRANSPORT Co., Cleveland, Ohio, has been authorized by C.P.A. to build a $100,000 lime plant at Gibsonburg, Ohio. This authority was granted because the plant was considered essential to increase production of scarce building materials.

Lime for Aluminum

REYNOLDS METALS Co. has announced that the St. Clair Lime Co., Oklahoma City, Okla., will start constructing a new lime plant 18 miles from Batesville, Ark., to supply lime for the Hurricane Creek alumina plant. The lime concern will operate under contract on limestone deposits owned by the Reynolds company. Minimum limestone requirements for the Hurricane plant are 100,000 tons annually. Batesville White Lime Co. has been the source of supply, but according to the Reynolds company, did not care to expand facilities for the enlarged production of alumina contemplated.

Selling Equipment

COWELL PORTLAND CEMENT Co., San Francisco, Calif., sold its Cottrell dust precipitator to Santa Cruz Portland Cement Co. Other equipment will be sold and the plant dismantled, in accordance with plans announced in the July issue of ROCK PRODUCTS.

The sale of this plant will take out of production about 2000 bbl. daily, but new kilns are being installed by Santa Cruz Portland Cement Co., Calaveras Cement Co., and Monolith Portland Cement Co. California Portland Cement Co. is installing new plant facilities in Arizona.

Open Sand Plant

THE FROST SAND AND GRAVEL CORPORATION, New Rochelle, N. Y., recently opened its sand and gravel plant at 40 Huntington Place. Col. Harry Frost, New York, N. Y., who has just completed terminal leave after being released from the Army, is the president-manager of the new company, which will deal in sand and gravel, crushed stone, cinders, cement, and concrete block. The new block plant will have a capacity of 10,000 sand and gravel and cinder concrete block per day.

Sell Gravel Concern

SHERIDAN SAND AND GRAVEL Co., INC., Sheridan, Wyo., has purchased the sand and gravel plant of Tony J. Plesky & Son. Officers of the new company are: Emil Livingston, president; Elwood Livingston, vice-president; and F. C. Williams, Jr., secretary-treasurer.

Partners in Ready Mix

WILLIAM TAYLOR and ROBERT TEPP have opened a ready mixed concrete plant near Chippewa Falls, Wis., on County Trunk Highway S near Anson bridge.

New Stone Plant

McCOLLUM ROCK PRODUCTS, INC., Springfield, Mo., will start production of road stone and agricultural limestone in August, 1946. Equipment includes a 25- x 40-in. Austin Western jaw crusher, a 4XC Gruendler hammermill, a 3- x 9-ft. Austin Western feeder, a double-deck 5- x 14-ft. screen, belt conveyors, and an all-steel, 100-ton capacity, two-compartment bin. The bin will be placed above platform scales so that stone can be weighed immediately as it is drawn from the bin. P. E. McCollum, owner, is a returned veteran, having served as a Lieut. j.g., for 2½ years. Two years were spent at Pearl Harbor.

Back Gravel Rezoning

TO PREVENT a threatened cut in sand and gravel production or the alternative of a large increase in cost, the Los Angeles, Calif., chapters of the Associated General Contractors and the Building Contractors of California, Inc., recently urged the City Planning Commission to rezone a part of the San Fernando Valley to permit such production. These agencies are backing the petition of John D. Gregg for rezoning 93 acres in the Tujunga Wash adjoining the company's present operations.

Dismiss Gypsum Case

A SIX-YEAR-OLD anti-trust suit against the United States Gypsum Co., Sewell Avery, board chairman, and six other companies and individuals was dismissed June 15 by a special three-judge federal court. Attorneys for the government were reported to have said that the case would be carried to the United States Supreme Court. The government charged the companies and individuals with conspiring in restraint of trade and establishing a monopoly in the gypsum industry by means of patent licenses granted to United States Gypsum Co., and accepted by the other firms.

Other defendants included: National Gypsum Co., Certain-teed Products Corporation, the Celotex Corporation, Ebsary Gypsum Co., Inc., and Newark Plaster Co. Individuals' mentioned were: Samuel M. Gloyd, doing business under the name of the Texas Cement Plaster Co.; Oliver M. Knode, Melvin H. Baker, Bror G. Dahlberg, Henry J. Hartley, Frederick G. Ebsary and Frederick Tomkins.

Converting to Diesels

COLUMBIA QUARRY CO., St. Louis, Mo., has announced through President E. J. Krause that the company is installing a 750-850 hp., supercharged Superior Diesel engine at Krause, Ill. A 400-hp. Diesel also is being installed at Valmeyer, Ill. Orders are being placed for three 3½-cu. yd. Diesel shovels. In addition two more 1½-cu. yd. shovels will be ordered for the Prairie du Rocher quarry.

New Ready Mix Plant

GARRETT CONSTRUCTION CO., Springfield, Mo., has started production of ready mixed concrete at a new plant in Springfield. Featuring a four-compartment Blaw-Knox 180-ton capacity bin, and a 600-bbl. bulk cement bin, this plant will operate in conjunction with the plant that has been operated by this company for the past six years. A fleet of 18 transit mixers serves the two plants.

Open New Quarry

MIDWEST PRE-COTE CO., Kansas City, Mo., has opened a quarry on the Birmingham river road, eight miles southwest of Liberty, according to Frank L. Carswell, president. The plant will have a capacity of 1000 tons of crushed stone. The old Atwood quarry at South Liberty, recently purchased, also has started up.

Start Wabash Plant

UNIVERSAL ATLAS CEMENT CO. has reopened the former Wabash Cement Co. plant at Osborn, Ohio, which it purchased in February, 1945. J. P. Camm is plant manager. Labor and material shortages have delayed the opening. The first kiln was placed in operation on June 11. Installation of a power plant is now under way for generating all electricity for the plant's own use. Part of the current is now being supplied by the company.

Early Hydrated Lime Process

Letter to the Editor:

"I notice in your article "Progress" under the heading Hydrated Lime on page 108 of the June issue that you call attention in the third paragraph to two new processes for hydration in February, 1904; one by O'Connel and Feely, New York City, and one by A. H. Lauman, American Hydrating Co., Delaware, Orio.

"We believe that you must be mistaken as regards A. H. Lauman, as my father, Mr. James Reaney headed the American Hydrating Co., under his own patent rights, and sold a number of the machines throughout the country. We are today operating one of these machines. It has been in almost constant use since its installation, about 1905.

"Mr. Reaney is still living, is 84 years old, and a resident of Baltimore, Maryland. We feel that a correction in this publication should be made in your next issue."

W. R. REANEY,
Scioto Lime & Stone Co., Inc.

Lime Research Fellowship

NATIONAL LIME ASSOCIATION has established a Fellowship at Rutgers University in the department of Sewage and Waste Treatment. It will be under the direction of Dr. Willem Rudolfs who selected R. P. Logan, a former National Lime Association fellow, to be directly in charge of the project. R. Y. LeVine, Ch.E., a graduate student, is carrying out the laboratory work. The program is concerned with the utilization of various types of lime products in the treatment of water wastes.

Pennsylvania Stone Outing

PENNSYLVANIA STONE PRODUCERS ASSOCIATION and the Agricultural Limestone Division will hold its annual outing at the Carlisle Country Club near Harrisburg, Penn., on August 23.

Ready mixed concrete plant at the Ensley No. 5 plant of Birmingham Slag Co., receives coarse aggregates from the slag plant by belt conveyor, left, and sand by bucket elevator, right

Changes Ownership

INDEPENDENT GRAVEL Co., Joplin, Mo., formerly owned by Guy H. Waring, Robert D. Toutz, Jr., and Earl C. Toutz, was purchased June 15, 1946, by William R. Snapp, Robert D. Toutz, Jr., and Earl C. Toutz. The entire interests, including limestone, chat, and tripoli plants in Mo., Ark., and Okla., are now owned by the new company. Mr. Snapp is president, Mr. Robert Toutz is vice-president, treasurer, and manager of production, and Mr. Earl Toutz is vice-president, secretary, and sales and traffic manager. The Toutz brothers have been connected with the Independent Gravel Co. for the past 26 years.

COMING CONVENTIONS

American Institute of Mining and Metallurgical Engineers, 75th Anniversary Meeting, Waldorf-Astoria Hotel, New York, N. Y., September 16-18, 1946.

American Concrete Pipe Association, Executive Committee meeting, DeWitt Clinton Hotel, Albany, N. Y., August 30, 1946.

National Concrete Masonry Association, Convention and Exposition, Hotel Sherman, Chicago, Ill., week of February 17, 1947.

National Crushed Stone Association, Annual Convention, Edgewater Beach Hotel, Chicago, Ill., January 27-29, 1947; Agricultural Limestone Division, January 30-31, 1947.

National Industrial Sand Association, Fall Meeting, Edgewater Beach Hotel, Chicago, Ill., October 24-25, 1946.

National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill., October 7, 1946.

National Ready Mixed Concrete Association, Annual Meeting, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

National Sand and Gravel Association, Annual Convention, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

Navy Takes Cement Output

SPOKANE PORTLAND CEMENT Co., Spokane, Wash., had 30-days' production tied up almost exclusively for construction of five additional storehouses at the Spokane Navy supply depot at Velox, according to an announcement by G. M. Bell, vice-president of the company. During this period, which ended early in July, the government required the company to put a certain amount of its production in sealed storage bins for Navy work at the depot.

Agstone and Ready Mix

WELDEN BROTHERS, Iowa Falls, Iowa, sand and gravel producers, have expanded their activities to the agricultural limestone and ready mixed concrete fields. The limestone plant, placed in operation in the summer of 1945, consists essentially of a 42- x 48-in. Gruendler crusher, a 15- x 36-in. Universal crusher, a 3- x 8-ft. single-deck Diamond Iron Works vibrating screen, and a 250-ton capacity silo storage bin. The ready mixed concrete plant, placed in operation in May, 1946, consists of a three-compartment Blaw-Knox bin of 105-ton capacity and two Jaeger transit mixer trucks.

Gypsum Production Up

LATEST figures made available on July 2 by the Bureau of Mines for the first quarter of 1946 show that gypsum board production in March, 1946, was up 7 percent over January, 1946. Shipments in March, 1946, were 238,100,000 sq. ft., as compared with 173,800,000 for the same month a year ago. Total estimated unfilled orders at the end of March, 1946, were 910,000,000 sq. ft. as against 252,600,000 at the end of March, 1945.

New Limestone Plant

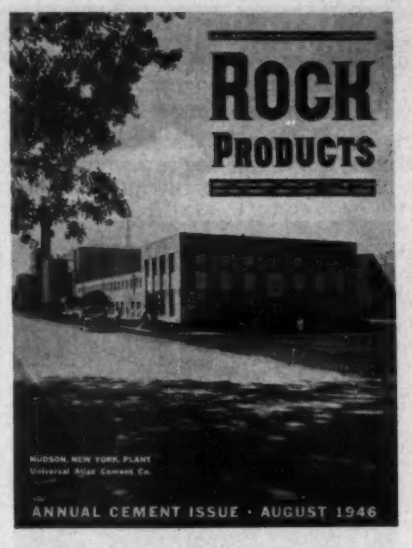
LIMESTONE PRODUCTS Co., Springfield, Mo., is now producing crushed stone for concrete work as well as agricultural limestone. The plant, formerly operated by Schneider-Williams, was purchased recently by Dwight Freshour and his brothers, who also operate a bauxite mine near Little Rock, Ark. Producing about 400 tons per day, the plant is equipped with two Telsmith gyratory crushers, a roll crusher, and trommel screens.

Diesel-Electric Locomotive

SOUTHWESTERN PORTLAND CEMENT Co., Osborn, Ohio, recently placed in operation a 65-ton Diesel-electric locomotive to haul stone from quarries to the plant. Ten trips are made daily with a train consisting of 11 cars.

Lime Plants Centenary

W. H. MOORES, president of The Moores Lime Co., Springfield, Ohio, congratulating us on our 50th anniversary issue, June, 1946, mentions casually that his company also is celebrating two anniversaries — 100 years in continuous operation and 50 years incorporated.



Reproduction of August cover page shows Hudson, N. Y. plant, Universal Atlas Cement Co. Test pavement, in which air-entraining cement was used, shown in foreground

Permanente Safety Award

BUREAU OF MINES has awarded the Permanente Cement Co., Oakland, Calif., the Joseph A. Holmes Certificate of Honor for an outstanding safety record during the period August 15, 1942, to January 23, 1946, when it produced 5,510,565 tons of rock without a lost-time accident.

Asbestos-Cement Plant

PARAFFINE COMPANIES, INC., San Francisco, Calif., has announced that its wholly owned subsidiary, the Plant Rubber and Asbestos Works, will build a $1,000,000 asbestos-cement products plant at Redwood City, Calif.

Agstone Producer

KENNETH KILKENNY has installed a crushing plant on the Gilbert Burgess farm eight miles northwest of West Plains, Mo. About 300 tons daily will be crushed.

In Ready Mix

GENEVA SAND & GRAVEL Co., Fontana, Wis., has installed a new hopper, and is now in the ready mixed concrete business.

Lease Gravel Property

SPRAGUE GRAVEL Co. has leased a large gravel pit northwest of Owosso, Mich., according to Ivan M. Sprague, owner.

HINTS and HELPS

PRACTICAL IDEAS DEVELOPED BY OPERATING MEN

Prevent Spillage

C. W. SHIREY, Waterloo, Iowa, is using the simple device, shown in the illustration, to prevent spillage when

Metal funnel guides mix into mixer drum

loading transit mixer trucks. It is a simple galvanized metal funnel, placed in the top of the drum of a transit mixer to guide the aggregates from the batcher into the drum.

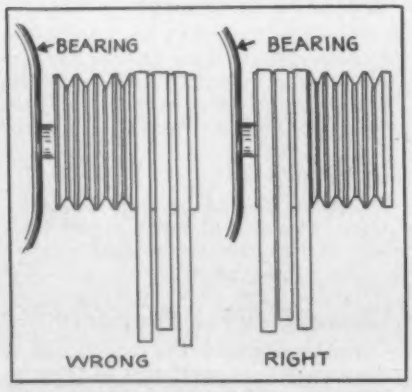
Improving V-Belt Drive

By W. F. SCHAPHORST

QUITE often V-belt drives are improperly belted as indicated by "wrong" in the accompanying sketch. This occurs when the sheave is only partially belted with only two or three ropes, the ropes being placed at the "end" of the sheave, as far away from the motor bearing as possible. It is done this way because it is the easiest place to put the ropes.

Don't do it that way. The correct installation is to place the ropes as close to the motor as possible, indicated by "right" in the sketch. By installing the ropes this way there will be less bearing pressure owing to the smaller leverage of the ropes through the shorter distance. In any belt drive, the greater the distance of the center of the belt pull from the center of the bearing, the greater will be the pressure of the shaft against the bearing and, consequently, the greater will be the friction and loss of efficiency.

This also makes clear one of the reasons why double-ply belts are preferable to single-ply; the center of pull of a double-ply belt is closer to the center of the bearing.



Showing "Right" and "Wrong" way of installing V-belt

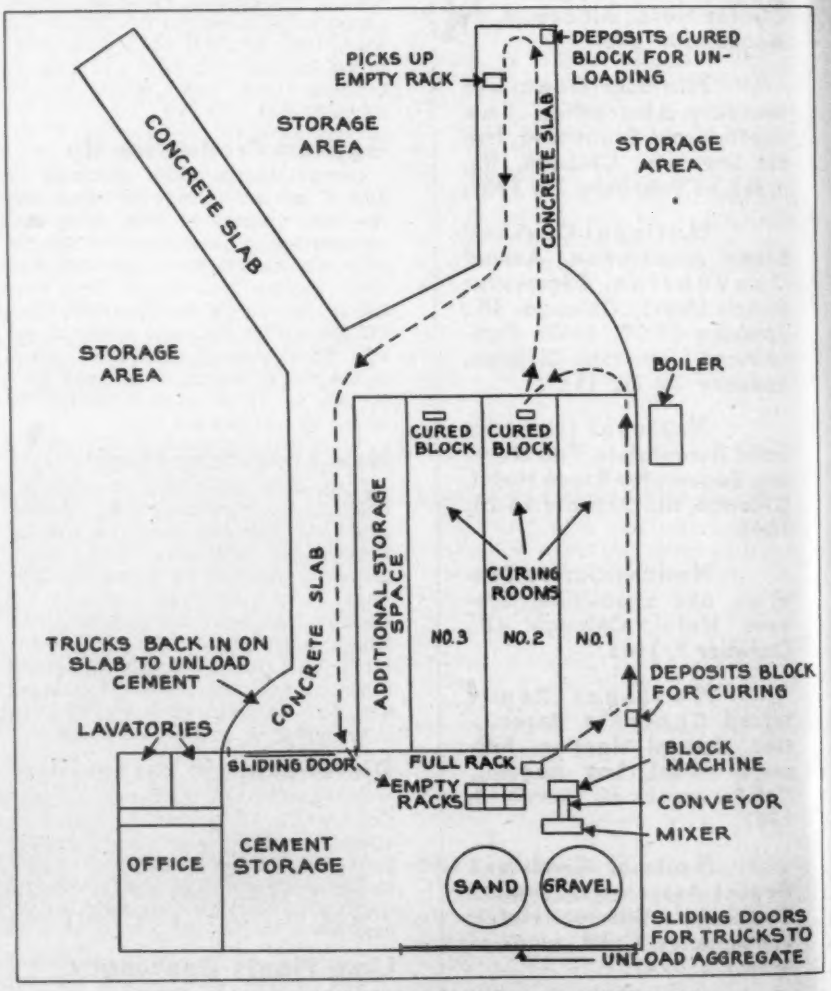
Efficient Block Plant Layout

DIXIE CONCRETE PRODUCTS CO., Memphis, Tenn., recently rearranged its block plant layout for more efficient operation in a limited space. The layout is shown in the accompanying plan sketch.

Aggregate is placed into the mixer with a wheelbarrow with the conveyor to the block machine located below floor level and enclosed in a concrete tunnel. The block machine is of the tamper type with an average production of 1000 block per 8-hr. day, but under the present set up this rate is going up.

Kiln rooms are wide enough for two rows of racks with sufficient space to maneuver in and out. An hydraulic lift truck with a 4000-lb. capacity and equipped with rubber wheels is used to handle the lift trucks to and from the curing rooms, with another unit having iron wheels for operation in the yard. The layout sketch shows how this comparatively small block plant has stepped up efficiency in handling block.

The company reports that at first some labor friction developed over the fact that men making 1000 block per day under the new, more efficient set up, were getting the same pay as when they were making 500 block per day. This was solved satisfactorily by a bonus plan based on a regular salary with an out-put of 5500 block per week, plus actual labor cost per block for any quantity over this average.



Plant layout for small block plant designed for more efficient operation

Insulating Blast Circuit Joints

By PAUL C. ZIEMKE

BLAST CIRCUIT SPLICES require special attention when these are part of blasting operations that must be performed in spite of rain, sleet or flood waters. Insulating material in the form of electricians tape is usually employed yet the application of it is tedious and a back breaking job when many splices must be made for each shot. Quite frequently splices are broken open by the workmen as they tear the roll of tape free from the splice once the proper number of turns have been applied.

Locating these breaks then requires much checking with the galvanometer before firing time. And, in northern climes the placing of tape is a bare hand operation that can cause great discomfort and suffering because of frost bites.

Applying hot tar insulation to blast circuit splice with simple equipment

Illustrated herewith is one method of heating and applying hot tar that speeds the insulating job immensely and renders a more durable and waterproof splice than that of taping. As each splice is withdrawn from the pan the portion of liquid tar adhering to it quickly congeals and forms a durable watertight joint. This joint can be immersed in water or submerged under protective matts for hours without serious leakage of firing current. While the cut shows the blaster dipping splices bare handed it does not imply that gloves or mittens are a handicap to the speedy and proper application of insulation compound or tar. By the dip method one man can insulate as many splices as ten others using tape.

Asbestos Uses

Two new asbestos products have been developed. One is an asbestos wick for a cigarette lighter, brought out by the United States Rubber Co., with the claim that by braiding the asbestos fabric, rather than using the former method of twisting, any tendency to unravel or fray is prevented and the wick will practically never require trimming or replacement.

The other, according to a recent issue of "Glycerine Facts," is the use of asbestos fibre in a recently patented puncture-sealing composition.

Cash In on IDEAS

• Nearly every plant has devised some method or equipment to reduce maintenance, prevent breakdowns, cut operating cost, improve lubrication or eliminate accidents.

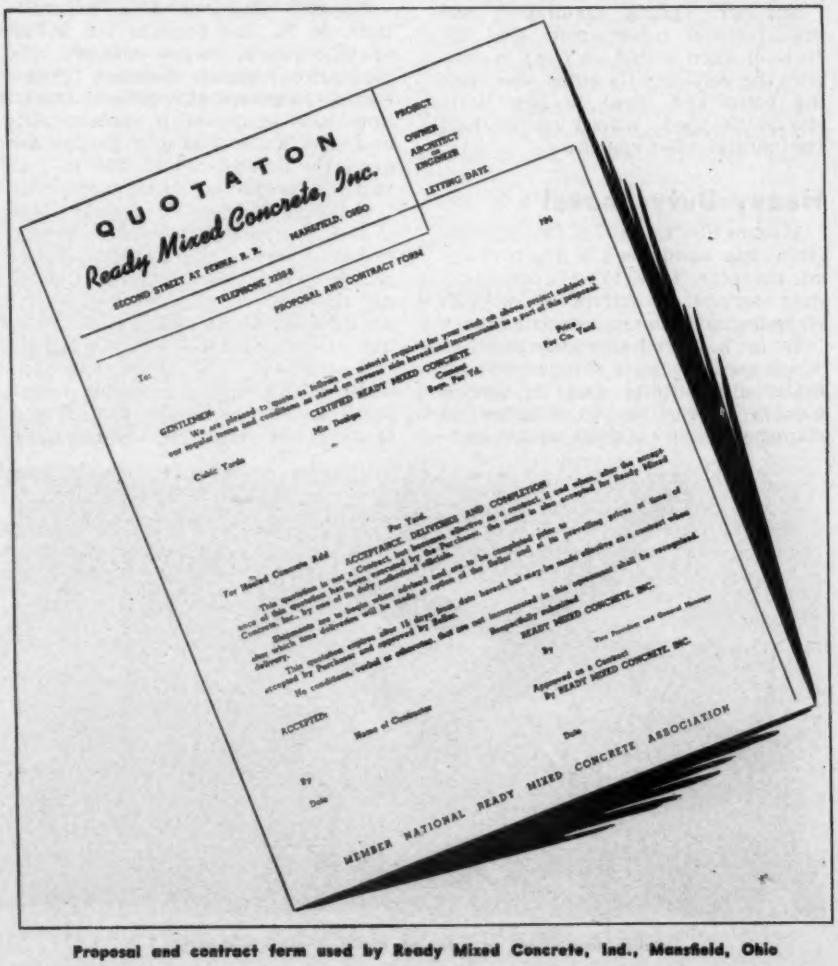
ROCK PRODUCTS will pay you for these ideas at the highest space rates. It isn't necessary to go to much trouble. Merely jot down your idea with a handy pencil or pen, and send us a rough sketch, drawing, or photograph to illustrate it, and we'll whip it in shape for publication. —The Editor.

Idea Wins $50

NATIONAL GYPSUM Co., Buffalo, N. Y., recently announced that Fred Myers, fireman at the York, Penn., lime plant won a $50 award from the company's Idea Bank for revising and improving the flow of air feed to the kiln gas producer. During 1945 the company announced that 80 percent of the Idea Bank Awards were earned by plant personnel.

Ready Mix Contracts

READY MIXED CONCRETE, INC., Mansfield, Ohio, is using a proposal and contract form which is very complete. This subject was brought up at the 1946 convention of the National Ready Mixed Concrete Association in Cincinnati, Ohio, and considerable discussion developed over the necessity of having the form as complete as possible. On the back of the form are listed the general terms and conditions of the contract. The terms and conditions cover the following: terms of payment; contingencies; freight rates; taxes; overtime deliveries; delivery conditions; shipping instructions; damage to trucks and equipment; detention of trucks at the building site; materials; orders under the contract; size of load; admixtures; added ingredients; and volume. Other points covered include selection of brand of cement, changes in contract, and responsibility for finished concrete.



QUOTATION

Ready Mixed Concrete, Inc.

SECOND STREET AT PENN. R. R. MANSFIELD, OHIO

TELEPHONE 22284

PROPOSAL AND CONTRACT FORM

PROJECT

OWNER

ARCHITECT OR ENGINEER

LETTING DATE

To

GENTLEMEN:

We are pleased to quote as follows on material required for your work on above project subject to our regular terms and conditions as stated on reverse side hereof and incorporated as a part of this proposal.

CERTIFIED READY MIXED CONCRETE

Mix Design

Cubic Yards

Cement Bags Per Yd.

Price Per Cu. Yard

For Ready Concrete Add

ACCEPTANCE, DELIVERIES AND COMPLETION

This quotation is not a Contract, but becomes effective as a contract, if and when, after the acceptance of this quotation has been executed by the Purchaser, the same is also accepted by Ready Mixed Concrete, Inc., by one of its duly authorized officials.

Shipments are to begin when ordered and are to be completed prior to ... after which time deliveries will be made at option of the Seller and at the prevailing prices at time of delivery.

This quotation expires after 15 days from date hereof but may be made effective as a contract when accepted by Purchaser and approved by Seller.

No conditions, verbal or otherwise, that are not incorporated in this agreement shall be recognized.

Respectfully submitted

READY MIXED CONCRETE, INC.

By Vice President and General Manager

Approved as a Contract

By READY MIXED CONCRETE, INC.

ACCEPTED:

Name of Contractor

By

Date

Date

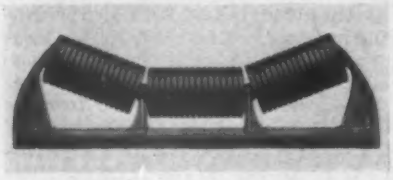
MEMBER NATIONAL READY MIXED CONCRETE ASSOCIATION

Proposal and contract form used by Ready Mixed Concrete, Ind., Mansfield, Ohio

New MACHINERY

Impact Cushioning Idler

CHAIN BELT Co., Milwaukee, Wis., has designed an impact cushioning troughing idler for belt conveyors now being manufactured by the company. Known as Rex Style No. 35 idler, each roll consists of a rubber cylinder vulcanized directly to the assembly tube. The cylinder has multiple grooves moulded into it; deep primary grooves for maximum cushioning to guard against belt carcass rupture, and shallow secondary grooves to provide surface softness for protection against belt cover laceration.



Each roll of idler is equipped for high pressure grease lubrication

For all loading conditions, the manufacturer recommends that the cushion idler should be used to support the belt directly under the loading point and three to four units should be used, spaced at one-half the normal idler spacing.

Heavy Duty Shovel

MARION POWER SHOVEL Co., Marion, Ohio, has announced a 3½ to 4-cu. yd. machine, type 111-M, for heavy duty service in mining, quarrying, stripping and general construction.

It is a Diesel-powered machine which can be readily shipped without major dismantling and it also is quickly convertible to dragline or clamshell service. Of all-welded construction and with a balance in design providing for low center of gravity, the machine is said to be stable under all digging conditions.

There are only two main shafts, mounted in anti-friction bearings, on the upper deck, providing direct line of power application, thereby simplifying maintenance and assuring added long life for the machine. Air control is provided for all operations.

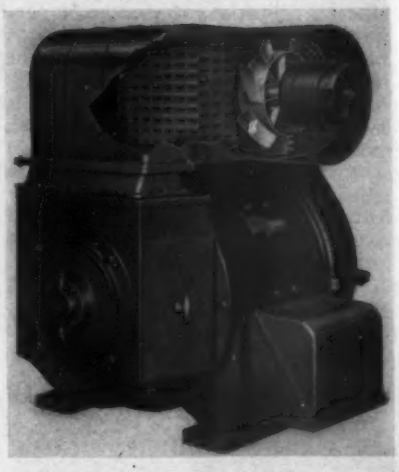
The shovel boom is of all-welded, full box section construction with rounded edges for added strength, and has a wide spread base. Boom point sheaves are extra large and sheave bearings are unusually wide. Shipper shaft pinions are double shrouded. The gantry, designed for quick knockdown for rail shipment, can be lowered to cab roof level by paying out on the boom hoist line. An independent live boom hoist may be supplied with the type 111-M for crane service.

Action view of 3½ to 4 cu. yd. Diesel shovel in a quarry

Unit-Cooled D-C Motors

GENERAL ELECTRIC Co., Schenectady, N. Y., has brought out a line of unit-cooled, totally-enclosed, direct-current motors designed for operation in severe atmospheric conditions such as prevail in cement mills and steel mills. The new motors are available in sizes 15 to 200 hp., at various speeds and voltages.

A unique feature of these motors is the dual ventilating system, which utilizes a compact unit cooler operating on a principle similar to that of an automobile radiator except that air instead of water is used for cooling. It has two sets of air passages arranged at right angles to each other. A fan on the armature circulates air through the motor and through one set of passages forming a completely enclosed system. External air, maintained at a constant rate of flow by an auxiliary motor and fan, travels through the other set of passages to absorb heat from the enclosed system.



Totally-enclosed d.-c. motor showing cut-away view of unit cooler

In case of failure of the auxiliary motor power supply or accidental restriction of the air intake, a thermostatic relay located in the airstream of the enclosed system protects the main motor.

Reversible Tooth Point

PAGE ENGINEERING Co., Chicago, Ill., has developed a reversible centershank, tooth point for dragline service. The hook bolt fastening is especially designed so that the bolt will not wear or tear loose from the point. It is claimed that the tooth point will never come loose or work off if 25 percent minimum bearing is maintained, both on the stub ends and on the shank above and below the bolt head.

Tooth point designed for dragline service

Hand Tachometers

O. ZERNICKOW Co., New York, N. Y., has designed an improved hand tachometer which is said to be accurate within one-half of one percent. There are many applications in the rock products industry where an accurate determination of r.p.m. is essential.

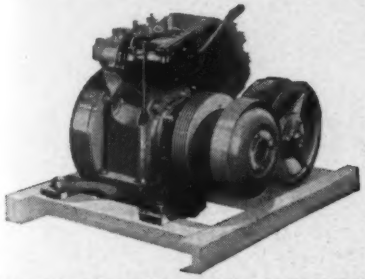
High Lift Shovel

THE BUCKEYE TRACTION DITCHER Co., Findlay, Ohio, has announced its Model 70 Clipper ¾-cu. yd. power shovel with a 22-ft. long boom and 17-ft. 4-in. dipper stick. The boom is 4 ft. longer than the conventional model and the dipper stick is 3 ft. longer. Deeper digging, higher dumping, and a greater digging radius is claimed for this unit. Long crawlers and wide crawler treads provide sure footing. All operations are vacuum power controlled.

Shovel of ¾-cu. yd. capacity with long boom and dipper stick

Automatic Drive Unit

SALSBURY MOTORS, INC., Los Angeles, Calif., has brought out what has been called the Power Package. It provides an automatic transmis-



Automatic transmission with almost infinite variable ratios

sion consisting of a variable diameter drive pulley, a variable diameter driven pulley, and a V-belt, giving infinitely variable ratios over a 4 to 1 range. Drive ratio is controlled as a function of driven shaft speed. Normal over-all reductions may range from 4 to 1 to 1 to 1 for light-duty, high-speed units, and from 200 to 1 to 50 to 1 for heavy-duty, low-speed requirements.

Built into the drive pulley of the automatic transmission is an automatic clutch which is a centrifugally-operated, opposed shoe type. The engine is the Salsbury Model 600. It is a single-cylinder, four-cycle, air-cooled type, developing 6.5 hp., at 3200 r.p.m.

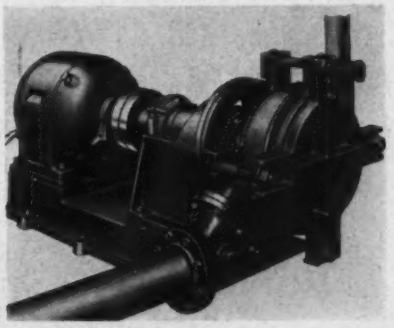
Slurry Pump

MORRIS MACHINE WORKS, Baldwinsville, N. Y., has announced its Type R slurry pump which is said to be free from packing troubles and to be designed to overcome the uncertainty of proper hub-sealing water pressures.

The pump takes its suction from the drive side, thus its packing is subjected only to the suction or positive-head pressures. It is said to operate equally well under high suction lift or a positive head, and it may be connected directly to any tank or be cut into the line as a booster pump without an intermediate pressure tank or a suction hopper.

Hydraulic passages in the suction disc are very large, and therefore velocities through these passages are low, scouring action is reduced, and the disc requires only infrequent renewal. The thickness of the suction disc liner has been increased over other Morris slurry pumps, especially at the suction entrance of the impeller.

The impeller is of the company's patented pressure-balance design designed to reduce thrust on the bearings and for smooth operation. Worn clearances on the side of the impeller can be closed by means of four adjusting screws. The adjustment moves the entire rotating assembly as a unit, including the impeller, shaft, bearings and bearing housings.



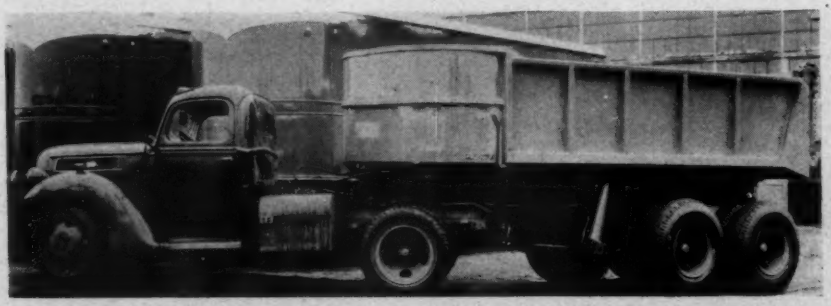
Impeller and liners of pump are removable without disturbing piping

All-Rubber Wheel

The B. F. GOODRICH Co., Akron, Ohio has announced the development of an all-rubber industrial wheel. It is constructed with a metal bearing sleeve molded integrally in a hard rubber core in which ball bearings for a choice of axle diameters are mounted. The company's "low power" E-Z rolling tread rubber compound is vulcanized to the hard rubber core.

Dump Trailer

FRUEHAUF TRAILER Co., Detroit, Mich., has brought out a dump trailer with 19-cu. yd. capacity. The announcement states that while the trailer unit was especially designed for coal haulage, it can serve equally well for hauling cement, sand and gravel, crushed stone and other materials. Body dimensions are 7 ft. 5 in. by 18 ft., and 47½ in. deep. Other models are available in 8⅓-cu. yd. and 15½-cu. yd. capacity.



Trailer with a capacity of 19 cu. yd. suitable for hauling crushed stone, sand and gravel, and coal

Main plant has 3 discharge gates from steel bins to load cars or trucks at either side and below

L. G. Everist, Inc., built Hawarden, Iowa, sand and gravel plant of structural steel for long life. Maintenance practices and changing methods and equipment have kept plant efficient

By H. E. SWANSON

Keeping An Old Plant Up-to-Date

By following a strict maintenance program at the Hawarden, Iowa, sand and gravel plant, owned by L. G. Everist, Inc., Sioux City, Iowa, the plant appears today as though it was placed in operation only a few months ago although built in 1928. It was constructed with a view to permanence, with concrete footings and flooring, and all-steel construction in the plant proper.

In addition to extra help who perform maintenance functions only, the men assigned to operational tasks also have their individual "clean-up" jobs at the stations to which they are assigned. Additional expenditures for maintenance during the time that this plant has operated have been repaid many times over not only because the plant looks new and is remarkably clean, but because equipment has been kept in working condition and breakdowns due to neglected equipment have been practically nonexistent.

Each man, assigned to his particular task in the operation of the plant, also must account for the condition of the equipment under his control and the cleanliness around his station. In addition to this, an oiler gives full time to service the equipment at the plant, and two oilers are kept at the two draglines at the pit. The oilers at the pit not only service the draglines, but also keep them clean, and assist in spotting trucks for loading. Two men are employed for the sole purpose of keeping the area around the plant neat and clean. Their task is to clean up the objectionable material discarded from the picker belts, and to wash away any spillage under the bins. The area under the bins is concreted and is provided with concrete ditches. The men hose the area, washing spillage into the ditches for disposal in a waste area near the plant.

A mechanic and a welder are employed on a full-time basis to assist in the continued full-time operation of the plant. Any major repairs are made after working hours or on Sundays, thus helping to assure a steady day to day operation. Although this entails overtime pay, it has been found profitable during the period that this plant has operated.

Plant Operation

While excellent maintenance has kept this plant in an "almost new" condition, the operation itself is also interesting as it was ahead of its time when the plant was built. Operating today as it did years ago, it compares favorably with newer and more modern plants. Very few changes have been made, which in itself speaks highly of an operation that has continuously produced 2000 tons daily for the past 18 years.

The deposit consists of a 30-ft. stratum of 60 percent sand and 40 percent gravel with a 5-ft. overburden. Overburden is stripped by a recently purchased No. 51B Bucyrus-Erie dragline with a 65-ft. boom and a 2-cu. yd. Page bucket. The overburden is wasted into previously

Trucks dump material from pit into underground hopper from which conveyor carries it to primary screening and crushing plant. Large pipe at left takes overflow from sand tanks to a waste pond some 700 ft. away

worked out areas in the pit. Underlying this overburden is the 30-ft. layer of sand and gravel, half above water and half below. The aggregate is reclaimed by a No. 604 Koehring dragline with a 55-ft. boom and a 2½-cu. yd. Hendrix perforated bucket. The deposit above water level is reclaimed first, then the deposit under water is taken out and stocked for dewatering. While one dragline loads trucks for movement to the plant, the other either strips overburden or moves to the lower level and reclaims the deposit under water for stocking and dewatering. It was found desirable to dewater before loading trucks, because trucks carrying a wet deposit saturate the road to the plant and make it unsuitable for driving.

In 1943 steam locomotive and tram car haulage was discontinued, primarily because the equipment was worn out and secondly because equipment was almost impossible to obtain during the war years. Truck haul was contracted, and has continued to the present.

Shale and Ochre Removed at Picker Belts

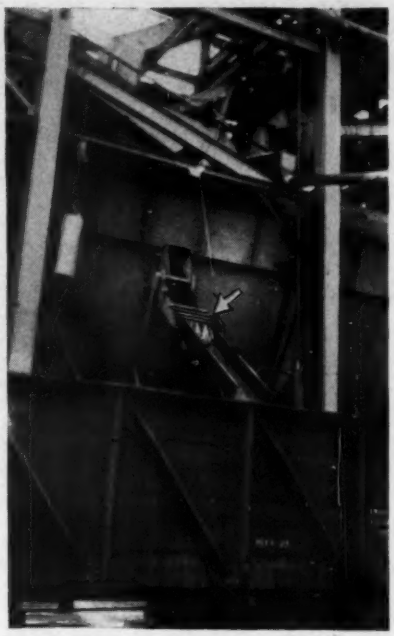
Trucks dump through a grizzly composed of inverted steel rails supported on I-beams, spaced at 10-in. centers, 20 ft. long and 10 ft. wide. The small amount of oversize is removed by operators at this station, throughs dropping into a 150-ton capacity hopper equipped with two Telsmith reciprocating feeders. Experience has shown that the two feeders give a more uniform flow to the belt conveyor than one larger feeder. The hopper is contained in a concrete pit, 20 ft. high, 15 ft. wide, and 20 ft. long, with a concrete housing for the belt, a distance of about 20 ft. from the pit. Water that may accumulate in the pit during heavy rains is removed by pumping to a nearby pond.

Feed from the hopper goes to a 24-in. belt conveyor equipped with Goodyear belting. The conveyor system, and the rest of the plant, was provided and constructed by the Diamond Iron Works. The conveyor discharges into a receiving box that feeds a 6- x 18-ft. rotary scalping screen, with 1½-in. square openings. Oversize, averaging about 5 percent, drops to a 30-in. belt conveyor for movement to a 10-in. Allis-Chalmers Superior McCully reduction crusher. Due to the presence of ochre and shale in the deposit, it is necessary to provide pickers at the belts to remove the objectionable material, therefore the oversize from the rotary screen is carried by the belt instead of dropping directly into the crusher. Although this belt is the most important picker station in the entire plant, pickers are also placed at the belt carrying the product from the hopper to the rotary screen and at the belt returning the crushed product to the first belt.

Crushed gravel is returned by a 24-in. conveyor belt to the primary belt going to the rotary screen. The product that passes the screen drops directly to a long belt conveyor feeding the main washing and screening plant. This 24-in. belt discharges into a receiving box where wash water is added. All washing water for the plant is received from a clear water pond, pumped to the plant through a 16-in. pipe by a Dayton-Dowd centrifugal pump with a 10-in. suction and a 12-in. discharge. The distance from the pond to the plant is about 800 ft.

Product Receives Thorough Washing

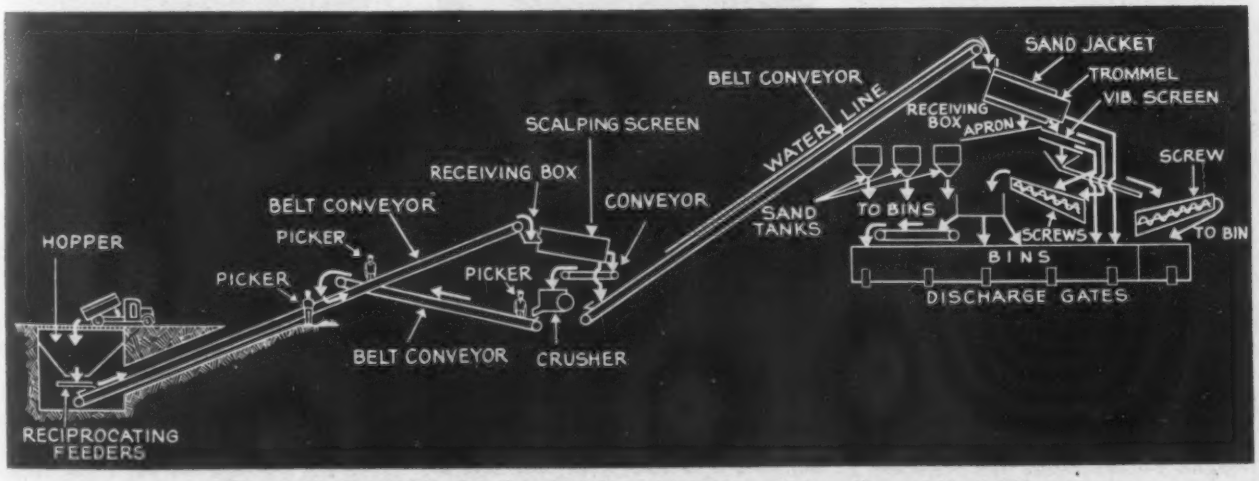
Material discharged from the long belt conveyor into the receiving box is sprayed with wash water from an 8-in. pipe before being sent into a trommel screen for sizing and desanding. The trommel is 6 ft. in diameter and 20 ft. long, and has a sand jacket, 8 ft. in diameter and 16 ft. long. Square openings on the inner screen and sand jacket are



Above discharge chute may be seen a series of spray pipes at right angles to the flow of material to wash it as it goes into the cars to rid gravel of any sand or silt. Waste drops through pipe under chute and flows into settling pond

¾- and 3/16-in., respectively. The load in the trommel receives another washing from a 2-in. pipe extending into the center of the screen for a distance 6 ft. from the discharge end. This spray pipe has ¼-in. perforations spaced at 4-in. centers.

Gravel retained on the inner jacket (¾- to 1½-in.) drops directly into one of the six 150-ton capacity steel bins; gravel retained on the outer jacket (3/16- to ¾-in) falls to a 4- x 8-ft. double-deck vibrating screen; and sand passing the outer jacket is laundered by apron chute to settling tanks. The vibrating screen has 5/16- and ¼-in. square openings on the upper and lower decks, respec-



Flow sheet of material going through plant, showing the excellent washing and bin facilities

Two men are employed to wash spillage from bins into ditch and to keep plant in a clean condition at all times. Wash water flows to ditch, right

tively, and during normal production the product retained on both decks drops into a series of four 16-in. x 16-ft. screw "deshalers," placed in parallel. Since the deposit contains an excess of ¼- to 5/16-in. gravel, provision has been made to divert the product retained on the lower deck directly to a bin. This product is sold as concrete block aggregate or as an aggregate for use in seal-coating for black top work. The product passing the lower deck of the vibrating screen is sent through a pipe into a single screw dewatering tank, the product from the screw dropping to a bin.

At the vibrating screen, another washing is given to the product. Four 1½-in. pipes above the screen, equipped with six Binks spray nozzles for each pipe, spray the product as it goes over the screen. These pipes are located lengthwise above the screen.

The product in the four screws, or "deshalers," also receives washing. Each tank is equipped with two 1½-in. pipes, one adding water at the upper end of the tank, and the other spraying the product from the bottom. The spray pipe, located at the bottom of the tank, running the full length, has 3/16-in. perforations spaced at 6-in. centers, that sends jets of water up through the load to float off the shale.

Discharge from the screws is into a distributing box from which the product flows into two bins or to a 24-in. belt conveyor, 12-ft. centers, that takes the finer gravel to the bin containing the 1½-in. gravel. It has been found necessary to add some of this finer product to the 1½-in. gravel to meet specifications for concrete aggregate. Regulation of the flow from the distributing box governs the amount of fines added to produce an aggregate that will satisfy the specifications.

Sand

The product passing the outer jacket of the trommel screen is laundered to a Telsmith sand tank, 8 ft. high and 6 ft. square on top and 6 in. square on the bottom. This tank, as well as the two that reclaim masons' sand, has an automatic discharge into bins. Overflow from the first tank, which reclaims concrete sand, is sent to two similar Telsmith tanks catching the finer sand. Overflow from the other two tanks is carried to a waste pond through a 16-in. pipe for a distance of about 700 ft. Under the discharge from the concrete-sand tank is a flume that takes the sand to a sump when the bin underneath is full. The sump, adjacent to the plant, has a capacity of about 200 tons, and as soon as it starts to fill up, the excess sand is pumped by an 8-in. Hetherington and Berner pump to a stockpile about 400 ft. away. The stockpile is located directly above spur tracks so that when the sand is to be reclaimed cars can be sent into the pile and loaded by crane.

Sand discharging from settling box drops to bin below or may be diverted to chute at right that sends it to sump. From sump sand is pumped to stockpile about 400 ft. distant

Each of the six bins has three discharge gates, one on either side and one underneath, for loading railroad cars on three spur tracks. Trucks are loaded under the bins. Chutes below the side discharge gates have a series of spray pipes located above, which give the product a final washing. Four pipes, with a total of ten 3/16-in. perforations, spray the gravel as it passes through the chute to cars. The chutes have a screen with ⅛-in. slotted openings through which any sand or silt adhering to the gravel is carried to a vertical pipe discharging to a concrete ditch, where it is washed to a waste area. In the water line that carries wash water to this operation is a trap, for the purpose of catching any foreign matter that may be pumped from the clear water pond.

Future Plans

Plans have been made to make changes that will improve performance. Vibrating screens will replace the rotary screen, and a log washer and sand classifiers will be added. These changes are planned for this coming winter.

Garland Everist is president of L. G. Everist, Inc.; J. P. Everist is general manager; and Edward Castell is superintendent of the Hawarden plant.

Connecticut Studies Concrete Aggregates

A SERIES of concrete tests are being conducted by the State of Connecticut, involving trap rock and gravel, in which an air-entraining agent is used in the concrete. National Crushed Stone Association, National Sand and Gravel Association, and the Public Roads Administration is cooperating with State engineers in the tests. Concrete specimens involving 90 mixtures of concrete, including 5, 6 and 7 sacks per cu. yd., and six different aggregates have been prepared.

Cinder Processing Plant

TROY SLAG PRODUCTS CO., Troy, N. Y., has a contract with the New York Power & Light Corporation to take over the cinder output from the coke plant. Cutler D. Perry, president of the slag concern, reports that the screening plant will be built to process the cinders and separate all metallic substances. The coke plant output of cinders is 150 cu. yd. a day, but the present cinder pile at the entrance to the Republic Steel Co., property contains 20,000 cu. yd. of cinders.

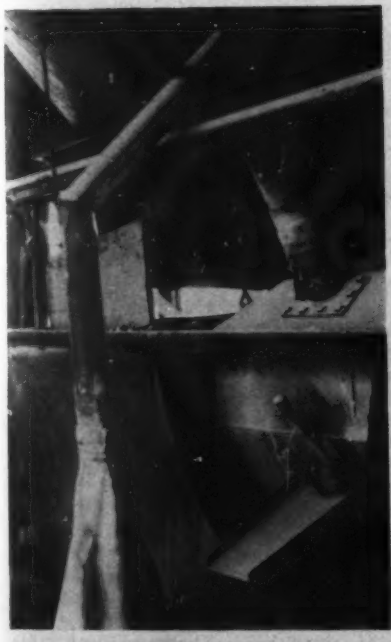
Fleet of twelve mixer trucks with batching plant in background. Long conveyor inclining up to plant from railroad track

Belt Carries Both Cement and Aggregates

Ready Mixed Concrete Co., Chattanooga, Tennessee, has two testing laboratories check materials and finished product

ONE of the largest and most progressive ready mixed concrete plants in eastern Tennessee, operated by the Ready Mixed Concrete Co., Chattanooga, Tenn., features service and quality of product to the customer. Equipment maintenance practices have assisted in continuous peak performance during the war years in spite of difficulties in obtaining parts and new equipment.

Proper proportioning of materials and strict observance of various specifications have given this company a reputation for production of a high grade concrete. To insure the continuance of this reputation, the services of two testing laboratories are engaged. Tests on materials and the finished product are made by both the Barrow-Agee and the Penn-Dixie laboratories.



Pipe rising from cement bin in batching plant catches cement dust and deposits it into sack at lower left

Aggregates and Cement on Same Conveyor

The area in which the plant is located is long and narrow, with a railroad spur at the far end, at right angles to the long axis of the plant area. This arrangement has necessitated the movement of both aggregates and bulk cement on the same belt conveyor, a condition which experience has proven to be less difficult than might be assumed. Bulk cement is carried by the belt conveyor from railroad cars to the main plant with negligible loss due to wind, and has resulted in a very satisfactory means of conveyance.

Aggregates, received in bottom-discharge cars and dumped into a hopper under the tracks, are fed to a 24-in. belt conveyor, 180 ft.-centers, for movement to the plant. A guide under the hopper limits the width of the flow to prevent spillage. The lower end of the conveyor is housed in an underground concrete pit. Material carried to the plant is directed to any one of six compartments of a Johnson Octobin through a swivel chute controlled at the discharge end of the conveyor. Three 200-ton capacity compartments receive three sizes of stone, one 100-ton capacity compartment takes sand, and two 400-bbl. compartments are used for cement.

Cement, received in bulk cement cars, is delivered through a screw conveyor, 6 ft. long, to the belt conveyor. A movable chute guides the cement to the center of the belt to prevent spillage. The chute can be elevated out of the way when aggregates are fed to the belt. When cement is received immediately after the delivery of aggregates, the belt is dried by attaching burlap bags to the framework of the conveyor and the belt is run for a short period which thoroughly wipes the belt clean and dry.

Batching Operations

Aggregates and cement flow by gravity from the bin to a Johnson

(Continued on page 119)

Aggregates and cement are both elevated from track hopper into batching plant bins over same conveyor belt

Developing Maximum ROTARY KILN Capacity

Second article on this subject deals with draft conditions, heat transfer, and stone sizing

By VICTOR J. AZBE*

A ROTARY KILN requires very little draft in itself; it does not require any more than it can produce. The effect of height of inclination in stack, that is, in draft generating effect due to temperature and consequently density difference, is more than necessary to overcome the resistance to the flow of gases through the kiln proper. There should be no concern about stack heights and draft loss, if only the resistance to flow is that through the kiln.

While draft loss of the kiln is low in proportion it is very high as a result of the circuitous and probably obstructed passage of the gases through the dust chamber, the rear kiln dam, and the stone feed pipe.

There may be a good draft at the base of the stack, but at the very same time gases may be escaping up the feed pipe, indicating that they are not readily able to leave the kiln, that there is pressure within the kiln, created by the hot kiln gases trying to force themselves out.

The rear constriction is necessary to prevent spill over of the stone, but it should never be any more than absolutely necessary. The combination of the constriction with the additional obstruction of the feed pipe and its dust laden hangers, combined with the fact that the high velocity gases are hot and so voluminous, causes a rather considerable friction loss.

The loss may not appear high when operated at low capacity, such as represented in the above series of kilns at the 50 cu. ft. per ton rate. It may be only 0.2 in., water gauge, but it increases as the square of velocity so that at the 35 cu. ft. rate it would be higher than twice this much or 0.41 inches. In fact it would be still higher because the gases would be hotter, their volume greater and velocity more than just that represented directly by the capacity increase. Therefore it may readily be 0.5 in., and what natural draft operated kiln has this amount of draft available at the kiln end in the dust chamber?

The front of the kiln may be closed off so air cannot readily enter the hood; the gases may not be readily able to leave the kiln, the dust chamber may have circuitous and blocked passages all creating friction, reducing flow and possible capacity. In addition there may be air leaks increasing the friction as well as reducing the draft by cooling the chimney.

As the exit area is such a factor and long kilns have the same exit area as short kilns, one cannot expect the limit of capacity from them if short kilns are handicapped on this account. Evidently what is demanded is induced draft, but if that is not existent then a careful draft survey is required. Even two inches off the rim of the rear choke may help greatly, because draft loss varies as the square of velocity.

If possible the net rear opening area when draft is poor, stack low and connecting losses high, should not be less than one square foot to 10 tons of lime produced, or the loss will be so high that it will limit the capacity. When draft is good and sufficient to allow a greater frictional loss at this point, the area of one square foot to 17 tons of lime produced may be allowed. For any greater flow rate, fan induced draft will be necessary.

Heat Transfer

In the rotary kiln, heat transfer is mainly by radiation; convection heat transfer is very low. It always is low in any apparatus of large gas passages. Convection heat transfer depends on velocity; that is, scrubbing effect for displacement of gases at the surface. It actually is conduction, as the gas particles delivering the heat to the lime or stone must contact it. Such contact creates friction, but the inside section of the rotary is about as friction-free as it can be. The only hope for making convection heat transfer a factor in rotaries is to divide the lime stream and the gas stream into smaller channels; that is, with gas and solid components closer, much closer together. This in some degree is being done now and may be more prevalent in the future. To make the rotary, which is a radiant heat apparatus, also a convection heat apparatus, would immensely improve it. For any effort in this direction, more draft, of course, would be necessary, but not so very much more as efficiency would be increased and gas volumes reduced.

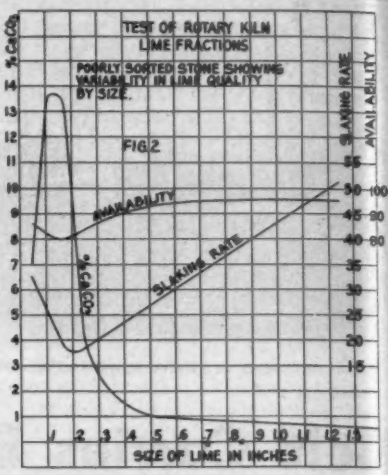


Fig. 2: Curves giving test results of rotary kiln lime fractions

Stone Sizing and Flow

But in the rotary as now operated, our only opportunity is to raise the gas temperature somewhat and lower the stone and lime bed surface temperature, allowing the fourth power radiation effect of the temperature difference to take hold.

Cooling the lime layer surface is as productive as heating the flame, only more so. In the apparently incandescent 2500 deg. F. mass, there is a great deal of only 1500 deg. F. temperature. If that could be brought to the surface, the most vexing problem of the rotary would be solved. However, available means of help are only closer screening of stone and faster rotation of kiln.

We must never allow ourselves to think that there is any flow of gas through the mass, there is none; or that there is much heat conferred on the lime by the underturning hot wall. Unfortunately, the hottest lime and the wall travel together and the lime or the stone that really needs the heat is from 6 to 12 in. removed.

Movement of stone and lime through the kiln is in sort of concentric shells, each shell holding the particles of one weight, although there is some sifting of the very lightest portions. The center will hold the particles of smallest weight and will be closer to the top than the bottom of the mass, because lime rolls faster down than it rises up with the kiln.

*Azbe Engineers, St. Louis, Mo.

The heaviest tend to the outside because of momentum; they roll the farthest and therefore hug the lining on the upward travel and are again ready to roll the farthest when freed on top. This continues until they lose weight through partial calcination and are replaced by other equally sized but heavier uncalcined portions holding a greater amount of CO_2.

This replacement action is very important, but unfortunately it does not take place in the preheating zone because there is no change of weight. The concentric shells establish themselves by size of particles and remain so all through, condemned to their respective positions by the laws of momentum.

However, even here, there is fortunately a compensating action, which also functions through the calcining section; that is, the concentric shells do not travel at the same speed down the kiln. The outer shells move considerably faster than the inner, so the portions of the lime layer which receive the heat the slowest, tend fortunately to remain in the kiln the longest. This can be readily observed when a rotary is being run out, when its tail tapers off through smaller and smaller lime to dust.

The compensating actions due to relative travel, position, interchange through change of weight and relative heat requirements and rate of burning, however, are insufficient and stone still must be sorted closely if the highest capacities are to be obtained.

The ideal, of course, would be all of precisely the same size but that would hardly be practicable, for the rest the proper size could be mathematically selected in which the change of position through change of weight, and the difference in rate of travel would be taken account of. This would also include some of the relatively small stone, of such size as would never appear at the surface, but also of such size as to have a high calcining rate so that its conversion would take place by the heat conducted to the interior from the shell of its outer mass.

Properly, however, the size should be such that all of the particles at one time or another appear at the surface. Such a kiln could be heavily dammed to prevent too rapid discharge and to increase the kiln load and time factor. To aid this, the inclination should be low and then the kiln should be rotated as fast as mechanically possible, a revolution in 30 seconds. This high speed will induce fast mixing and a lower surface temperature for much faster heat transfer.

The combination of dams with high speed, however, will help any kiln with any reasonably good sorted stone, even with a considerable fines content, but the two must be put in effect together; dams without speed or speed without dams just will not do.

What surprising effect poor sorting of stone has on a rotary was revealed in one case where lime from the kiln was screened into three sizes of which the larger had 1.34 percent core, the medium 8.5 percent, and the smallest portion 33 percent.

In this respect Fig. 2 is also very interesting. It represents lime from very poorly sorted stone and shows that virtually every size portion has a different and distinct quality of its own.

In both of the above cases, lime fairly low in CO_2 can be obtained but at the expense of a considerable capacity loss.

Fig. 3 presents, in a somewhat crude fashion, an ideal of good and poor rotary kiln stone size ranges. The "Full Size" may be either 2½, 1½ or ¾ in., as it does not matter. In the case of "Full Size" being 2-in. stone, "Half Size" would naturally be 1-in. stone.

Curve "A" in this figure represents stone all of one size. Such stone would mix in the preheating zone, it would not stratify into concentric shells. It all would preheat at about the same rate, all be at about the same temperature. In the calcining zone it would stratify, but according to weight loss. Lime of greatest CO_2 content would ride in the outer shell, that of the least in the middle; all precisely as it should be but never really attainable. Heat absorption rate and capacity would be the highest.

"B" embraces the size range of which the smallest and therefore the lightest, portion would not appear at the upper surface in the preheating zone but would tend to do so in the calcining zone after the larger component of the mass would have lost most of the CO_2. Exposure would unlikely be complete as any loss of CO_2 by the small stone would tend to drive them below the surface, but there would at least be a fair intermixing in the mass.

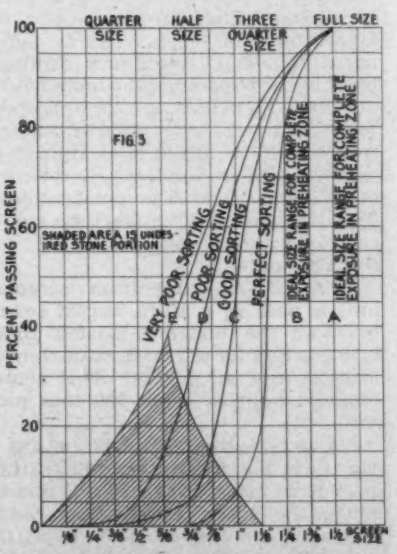


Fig. 3: Showing graphically the range from good to poor rotary kiln stone sizes. (A) ideal size for complete intermixing in preheating zone; (B) size range for complete intermixing in calcining zone; (C) good practicable sorting; (D) poor sorting; (E) very poor sorting

"C" is still very good and, when all stone sizes have to be utilized, it could be called a somewhat impossible ideal. Although ideal as to sorting, it would not be any more ideal as far as burning is concerned, and this size is already limiting heat absorption and distribution and therefore reducing capacity.

"D" and "E" are progressively worse conditions with "D" fairly common and "E" exceptionally bad, represented by the Fig. 2.

The shaded area of Fig. 3 is the undesired stone portion, the capacity and quality inhibiting size portion. If it is expected that this also discharges from the kiln completely burned, then kiln performance is bound to be impaired in capacity, fuel consumption, life of lining, and also in scale ring formation. For the very highest CaO content, the impairment in performance will be so great that some sort of compromise is necessary. Better screening is desirable, but if not making lime with fines slightly underburned, screen it, using it in the hydrator, and sell or discard the increased tailings.

1946 Building Materials

ESTIMATES have been made by the federal government of building materials to be consumed during 1946 based on $8,855,000,000 for new construction, $5,150,000,000 maintenance, and assuming that 1,200,000 residential units will be started. Concrete block consumption of all kinds will total 600,000,000 units for the year divided into 100, 127, 172, and 201 million units for the four quarters, respectively. Gypsum board, including lath, will call for a consumption of 3,500,000,000 sq. ft., during 1946, divided into 646, 809, 1,060, and 985 million square feet for the four quarters. Cement consumption has been estimated at 126,000,000 bbl. in 1946, divided into 22, 30, 41, and 33 million barrels, respectively, for the four quarters.

Waterproofing Concrete

NATIONAL BUREAU OF STANDARDS announces that routine tests on methods and materials submitted for waterproofing concrete and masonry have shown little that is basically new or superior since the Bureau's first report on the subject, 35 years ago.

Gypsum Mine MECHANIZATION

Second and concluding article on mine mechanization covers mechanical loading equipment

By E. R. CUSHING

Cable reel shuttle car of 8-ton capacity loaded by 50 h.p. mobile loader in potash mine

PRIOR to 1940 several experimental mechanical loading devices were given trials in gypsum mines and eventually discarded to return to hand loading direct into mine cars. Basically, the poor performances of these original ventures was attributable directly to mechanical failures of the equipment. However, even coal mines mechanically loaded only 5% of their total underground production in 1928, 12% in 1934 and did not reach a 50% figure until 1943. Naturally though that 50% figure represents a lot of coal—about 250 million tons.

Coal mining mechanical loading equipment proved applicable to gypsum mining, particularly in flat seam workings which are the general rule in gypsum. The main problems in the transition of the equipment from coal handling to gypsum have been the added specific gravity of gypsum (coal 85 lb., gypsum 144 lb. per cu. ft.) and the clogging effect of gypsum dust and rocks in machine working parts. These difficulties are gradually being overcome by revising and strengthening the equipment to meet rock handling specifications.

Scraper—Loaders

Scraper-loading has met with varied success in gypsum mines as exemplified below:

MINE A—Triple-drum 25-hp. hoist mounted on mine flatcar operates hoe-type scraper in 48-in. seam. Operator is at the working face with push-button remote control of cable drum hoist at the haulageway. Scraper pulls rock up a ramp into mine cars. Seven of these units were installed as a wartime expedient to increase production with available unskilled labor too old to hand load. Average shift production per unit was 50 tons and costs were in excess of piecework hand loading. Comparatively small tonnage per room caused too much lost time moving hoist, cables, sheaves, etc.

MINE B—Triple-drum 25-hp. hoist was mounted on top of mine car anchored on outside track of double track opposite scraper loading ramp in 8-ft. seam. It was operated from side levers with scraper pulling rock up ramp and dumping into 2½-ton mine cars through overhanging frame. Production was about 80 tons per shift for four men drilling, blasting and scraping into mine cars using six ramps. With 25-ft. room widths, shooting off solid netted about 50 tons per room. This scraper operation labor cost was 40c per ton as compared to regular piecework drilling, blasting, and loading plus mule haulage and track-work, costing 75c per ton. However, the scraper-loaded rock had to be mixed one car to five cars of regular hand-sorted rock in order to meet quality specifications. This was essentially a wartime stopgap operation now converted to trackless mining.

MINE C—A triple-drum scraper unit is used in a 10-ft. height seam to move the undercut-blasted rock into position for a Traxcavator shovel loading into mine cars. This combination handles about 180 tons per shift.

Scraper-loading methods in gypsum have not been developed to the efficiencies achieved in metallic mines where the highly abrasive ores and irregular ore bodies have necessitated this method of mechanical recovery. Comparatively small investment in scraper-loading equipment offers the gypsum mine operator an excellent cost-saving opportunity, particularly in small production mines where initial investment is the deciding factor. In the Tri-State Zinc Mines the specially designed caterpillar-mounted 25-hp. triple-drum scraper-loaders average 210 tons per 8-hour shift with a loading cost of 23c per ton for labor, power and maintenance. The track-mounted potash mine scraper-loaders average 450 tons per 8-hour shift with 16c per ton loading cost in undercut rooms 10 ft. high, 36 ft. wide, breaking 200 tons to a room.

Hand Loading with Conveyor

Various types of conveyor units have been used in gypsum mines to boost hand-loading production and reduce costs. While usually effective in raising tons-per-man produced, the cost savings proved negligible—actually increasing costs in most instances. The total cost of added maintenance and moving and setting up equipment overbalanced whatever savings were made in loading production.

Only wartime necessity kept this type equipment in temporary operation. The standard type of hand-loaded conveyor units (belt conveyors, shaker conveyors, etc.), such as adopted in coal mining, proved too light in handling gypsum from the working face to the main haulage.

Using caterpillar - mounted Joy Junior loading machines (26 in. overall height) in 42 in. height gypsum loading into scooter-box conveyors, a Western New York operator increased production and lowered costs. The Joy type loading machine is a continuous loader in that two loading head gathering arms are continuously digging in the rock pile and depositing the rock on the 22 ft. length central discharge conveyor. The Joy Junior loader has a 4-hp. motor direct-drive on each gathering arm and each caterpillar traction. An additional 3-hp. motor operates the hydraulic system used to raise and lower the loading head and to swing the 12-ft. tail section of the discharge conveyor 45 deg. right or left. This loading machine is rated from 2 to 3 tons per minute and was operated in seams as low as 28 in.

Top: **Battery-operated shuttle car of 10-ton capacity, with rear-wheel traction and driven by two 7½ h.p. motors. It has a bottom discharge conveyor with a single 7½ h.p. motor**

Center: **Shuttle car discharging 10-ton gypsum load in 60 seconds into 15 h.p. portable conveyor dumping into 1½-ton mine cars. Separate 7½ h.p. motor drives 40 in. width shuttle car with bottom-discharge conveyor**

Two types of scooter box conveyors were used. The open-end type scooter boxes were 4 ft. wide, 6 ft. long and 14. deep, held about 1500 lbs. of gypsum, and were shuttled back and forth between loading face and mine cars by a 20-hp. double-drum hoist mounted on a flat car. The pull rope operated the sliding back-end gate which is automatically unlocked at the unloading ramp, dumping the load into mine cars, then the tail rope locks the gate back in place, returning the box to the face by means of the tail sheave anchored to a steel roof jack. Two boxes were used with six loading ramps in 25 ft. wide rooms driven about 250 ft. off the haulageway.

The necessity of moving the double drum hoist and open-end boxes from room to room was eliminated in the Smith bottom-drop type drag line conveyor boxes with a portable overhead dumping ramp and jack-type deflectors for right angle turns. The deflectors consist of three horizontal arms pivoted on a roof jack with vertical rollers mounted on the arms guiding the pull rope and the scooter box turning corners. The dumping ramp was demountable, anchored with roof jacks, and the bottom-drop scooter box dropped the load from overhead into the mine cars. The box was 5 ft. wide, 6 ft. long, 12 in. deep, held about 1500 lbs. of rock, and was hauled up to 450 ft. distance from face to dump. The 20-hp. double-drum hoist was set on timbers on either side of the dumping ramp.

The 1½-ton mine cars were spotted by the hoist operator at the ramp with a push-button controlled 5-hp. Brown-Fayro car pulling hoist having 6000 lbs. rope pull at 25 ft. per min. speed. Loads were pulled against a track grade to eliminate slack and resultant car rolling.

Loading and delivering the rock to mine cars, a 6-man crew (loader operator, helper, timberman, hoistman and two cleanup men) on scooter box production averaged 125 tons per

Left: **Underground power station. Left to right: Tire pump compressor, automatic charging panel for two 450-amp. hr. battery shuttle cars, 40 h.p. motor-generator charger, 300 h.p. main motor generator set, and auxiliary 115 h.p. motor-generator set**

shift, costing 47c per ton labor, power and maintenance. Hand loading this same tonnage required a 10-man crew (six hand loaders, timberman, pushman, trackman and cleanup man) costing 65c per ton. Loading machine averaged two hours per 8-hr. shift removing roof falls. Scooter-box conveying is essentially economical mainly for seam gypsum and, where headroom permits, has been replaced by shuttle car haulage. A special application would also be in sinking a mine slope using scooter boxes for rock removal to the surface.

Mobile Loader with Shuttle Car

The use of caterpillar-mounted loading machines with battery-operated rubber-tired shuttle car haulage has been given the widest application in mechanizing gypsum mine operations. The loaders have loading rates ranging from 2 tons per min. (26 in. height) to 8 tons per min. (60 in. height) with shuttle car capacities from 4 tons (35 in. height) to 10 tons (60 in. height). Shuttle cars operate at 3½ to 4 mph. loaded, 4 to 5 mph. empty and unload in less than 60 seconds.

The shuttle cars may be called mobile conveyors since they have a flight conveyor on the bottom which moves the rock from the wide hopper loading end forward in the car and discharges the load out the open front end. Shuttle cars are available either battery, trolley or cable-reel operated. Storage battery operation lends itself to maximum flexibility and cars will negotiate 5% grades loaded and as much as 20% grade against the empty car. Gypsum mine shuttle car installations to date have been storage battery operated.

The following are examples of mobile loader operations with shuttle cars:

MINE A—Joy Junior loader with two Joy 32D shuttle cars, 337.5 ampere hour Edison batteries, 4-ton shuttle car capacity. These shuttle cars are 35 in. overall height, 7 ft. 6 in. wide, 20 ft. long, operating in 42 in. height gypsum seam, 25 ft. room width, with 10 ft. runway between roof props. Maximum hauling distance from the face was 400 ft. of level grade to dumping ramp, with 5-hp. Brown-Fayro car spotting hoist and 1½-ton mine cars.

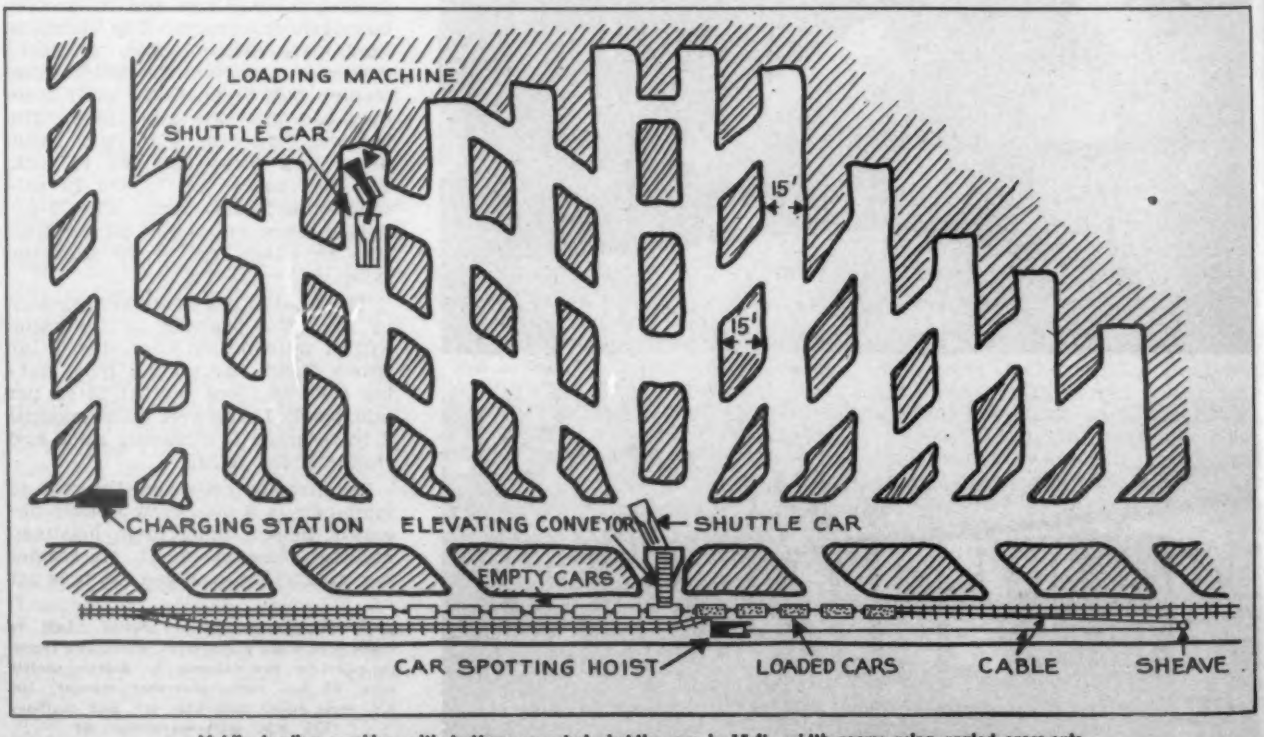
Crew, consisting of seven men (loader operator, helper, two shuttle car operators, timberman, car spotter, cleanup man) average 180 tons per 8-hour shift@37c per ton labor, power and maintenance cost compared to 6-man crew with Joy loader and scooter boxes delivering 125 tons @47c. Hand loading 189 tons would require 16-man crew@65c per ton cost.

MINE B—Joy 14BV loading machine, 36 in. overall height is operated with four 5-hp. motors with chain drives to gathering arms and tractions plus 4-hp. hydraulic system motor, in combination with three Joy 32D shuttle cars, 300 ampere-hour Exide batteries, 4-ton shuttle car capacity. Maximum haul, slightly favoring load is 500 ft. one way in 48 in. seam, 25 ft. room widths, shuttle cars dumping from inclined ramp into 4-ton capacity mine cars.

This setup required nine men (loader operator, helper, three shuttle car operators, two timbermen, car spotter, and cleanup man) and produced an average of 275 tons per 8-hour shift costing 28c per ton for labor, power and maintenance. This compared to 58c per ton for an equivalent tonnage requiring a 14-man hand loading crew.

MINE C—Operating in 10 ft. height gypsum seam with 20 ft. room widths, a Joy 11BU loading unit was used with a single Joy 60D shuttle car, 450 amp. hr. Edison batteries, 10-ton car capacity, dumping into a Joy 15-hp. elevating conveyor to the 2½-ton mine cars. The loading machine was rated at 8 tons per minute loading rate with a single 50-hp. motor operating the gathering arms, conveyor and caterpillar tractions plus a 5-hp. hydraulic pump motor. The shuttle car was 5 ft. overall height, 22 ft. long, and 8 ft. wide with a 6-ft. wide rear end loading hopper and 40 in. wide bottom discharge flight conveyor. Maximum haulage distance from the loading machine to the elevating conveyor was 700 ft. of practically level grade with an average haul of 400 ft. Mine cars were spotted with a 5-hp. Brown-Fayro hoist.

Daily shift production averaged 340 tons with a 4 man crew (loader operator, shuttle car operator, con-



Mobile loading machine with battery-operated shuttle cars in 15-ft. width rooms using angled cross-cuts

veyor operator and handyman) loading and delivering rock into mine cars for 15c per ton labor, power and maintenance cost. Hand loading methods for a like tonnage required 16 men (10 hand loaders, three mule skinners, and three trackmen) and three mules for a total cost of 41c per ton.

MINE D—Delivering rock directly into the underground mine crusher, a 3-man crew (loader operator, shuttle car operator, and paving breaker man), used a Joy 11BU loading machine and single Joy 60D shuttle car, and loaded and hauled an average of 350 tons per 8-hr. shift. The 1,000 ft. one-way shuttle car haul with a 1% grade against the 10-ton rock load required about 15 miles round trip shift haulage for the 450 amp. hr. Edison batteries. In order to eliminate on-shift extra battery charging and delay, a 15 hp. d.-c. motor-generator set was installed at the crusher hopper and plugged in directly to the 7½-hp. car unloading conveyor motor.

Operating labor averaged 5c per ton with power and maintenance 4½c per ton, totalling 9½c per ton as compared to former hand loading methods, with horses hauling mine cars, costing 45c per ton and requiring 23 men and 7 horses.

Since all of the mechanization projects exemplified were installed and operated under wartime handicaps of labor and equipment shortages, both in quantity and quality, it is logical to conclude that the results achieved are being further improved as these difficulties ease off.

Advantages of Mobile Loaders

Mobile loaders with shuttle car haulage offer the following advantages:

1. Maximum flexibility of operation. Loader and cars can be moved between working places or sections of the mine more readily than scrapers or scooter box setups.

2. Working place trackwork and haulage eliminated.

3. Mainline trackwork and haulage reduced to a minimum by allowing longer room lengths.

4. Loader operational time losses held to minimum, since the shuttle car operator can "spot" his loading hopper directly under the loader discharge boom.

5. Waste rock can be loaded into shuttle car and disposed of handily.

6. Maintenance costs are not excessive, varying from 3 to 5c per ton.

Various operational characteristics of mobile loaders and shuttle cars may be summarized as follows:

(a) The large sized units have been operated in 10-in. depth water and the smaller units in 6-in. depth water without difficulty.

(b) Shuttle cars will haul loads up a 5% grade with storage batteries and more than 10% grade with cable-reel power.

(c) Loaders and cars will operate over comparatively rough bottom providing the surface is hard enough to prevent bogging down.

(d) Mobile equipment may be used in workings, at first glance considered too narrow for clearances, by developing proposed haulageways with 45 deg. instead of 90 deg.-angled cross-cuts, using 4-wheeled-steering shuttle cars and installing special timbering where required.

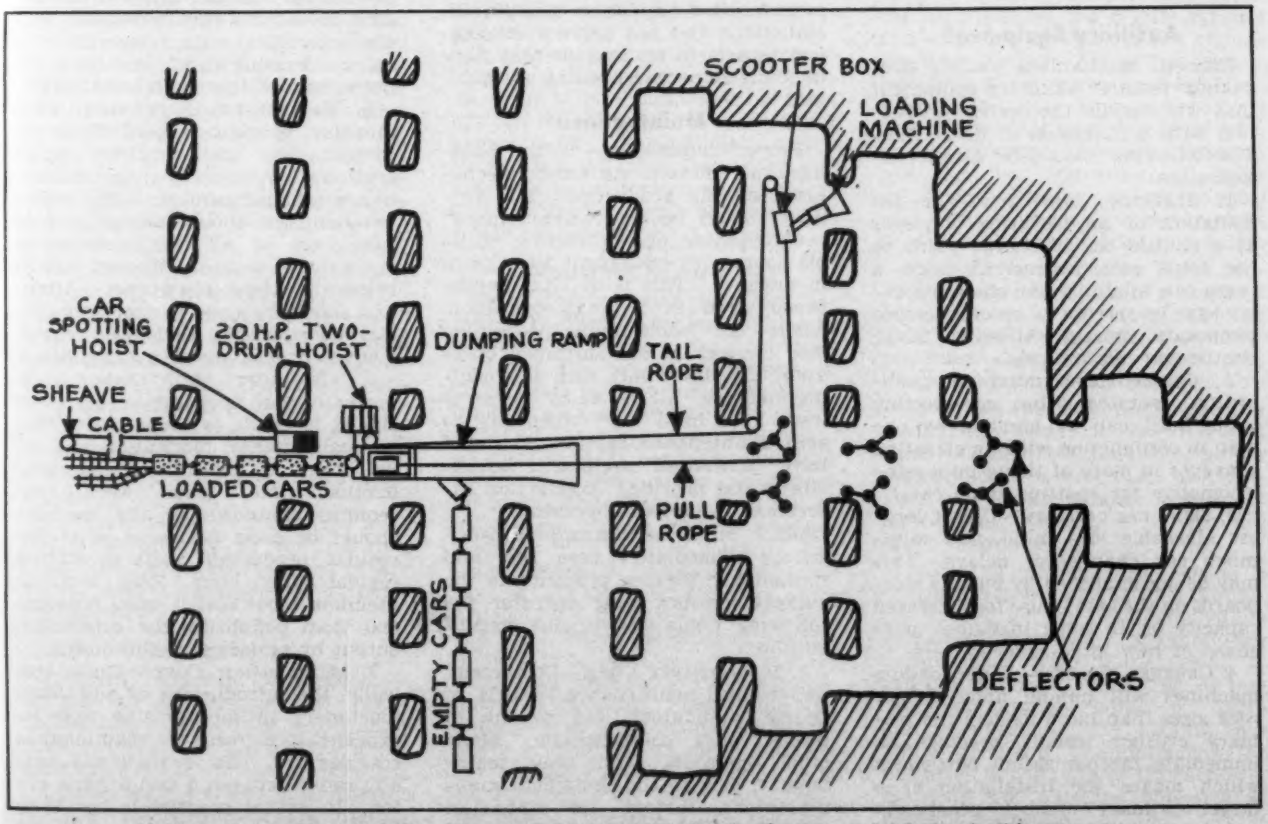
Mobile loaders and shuttle cars are available in a wide range of sizes, capacities and power characteristics. The selection of the proper type, size and number of units of equipment for a specific mine operation depends on the following factors:

1. Physical characteristics of the mining seam such as height of working places, seam gradients, clearance widths, timbering and roadway factors.

2. Required daily production as it affects number of units and the comparative economics of single, as against multiple, working shifts.

3. Capacities of auxiliary equipment on hand or required, such as elevating conveyors, mine cars, car spotters, locomotives, crushers, hoists, conveyors, etc.

4. Most economical power characteristics pertaining to costs of installation, operating, and maintenance, along with safety of operations.



Mobile loading machine with bottom-drop scooter box, overhead steel dumping ramp and deflectors in 42-in. gypsum seam

Discharging gypsum loader into open-end scooter box in 42-in. gypsum seam. Locking bar for sliding back-end gate is automatically tripped at the dumping ramp with cable pulling gate through box to unload. Tail rope relocks gate and returns to the loading face

5. Combining all of the above essential factors into a definite plan of operational production cycle.

While no hard and fast rules for equipment selection can be laid down to cover all types of mines, it is well to bear in mind that, other factors being balanced, the operation of large-sized units all the way down the line requires no more manpower per unit than small-sized units and results in higher production per man-hour.

Auxiliary Equipment

Efficient mechanized loading production requires auxiliary equipment that will handle the loader production with a minimum of delay time. The following should be given consideration:

1. ELEVATING CONVEYOR—The installation of an elevating conveyor at a shuttle car discharge point to the mine cars instead of using a ramp can minimize car changing delay time by serving as an on-the-spot temporary storage, allowing faster shuttle car discharging.

2. CAR-SPOTTING HOIST—A push-button operated 5-hp. car-spotting cable hoist can be handled by one man in conjunction with an elevating conveyor in place of tieing up a mine locomotive for spotting mine cars.

3. MINE CAR CAPACITY—Use of largest allowable size mine cars minimizes car changeover delays. This may be accomplished by putting sideboards on the cars in use for increased capacity or, in some instances, purchase of new large-capacity cars.

4. CRUSHER CAPACITY—Since loading machines will handle much larger rock sizes than hand loaders the primary crusher usually becomes an immediate mechanization bottleneck which makes the installation of a larger primary crusher practically mandatory with resulting substantial increased production paying dividends.

5. HOISTING CAPACITY—Present coal mining practice has practically eliminated shaft-hoisting in new mine installations. Slopes with belt conveyors from mine to surface for as much as 600 ft. vertical depths have proven more economical than shaft or slope mine car hoisting for large production. Slope installation with belt conveyor to the surface and crusher underground is worthy of consideration in future gypsum installations and has definite economical aspects in revising present slope or shaft mine car hoisting setups.

Maintenance

Proper maintenance is the backbone of efficient sustained mechanized mining production. The keynote should be "over-maintenance" —anticipating and correcting possible sources of equipment breakdown in advance. This is of vital importance, even in a small operation, where the whole mine production may depend on the sustained operation of a single unit, such as a loading machine. All too many operators learn "the hard way" when intelligent maintenance beforehand would have minimized equipment breakdowns and provided "production insurance" for smooth operation.

Since mine mechanization installations immediately pose new and special maintenance problems to the average gypsum mine operator the following items deserve due consideration:

1. MAINTENANCE LABOR—Competent, well-trained maintenance labor is, of course, mandatory and worthy of proper wage compensation. Many mine operators send their maintenance men to the equipment manufacturer's factory for detailed schooling on the fabrication and maintenance of the equipment in use. The operators of the equipment should be thoroughly familar with the correct handling and maintenance of their equipment and be capable of making minor repairs and adjustments during the working shift.

2. INSPECTION—Daily written reports should be submitted by each machine operator on the mechanical condition of his equipment, with causes of breakdown delays detailed as well as items requiring immediate attention. Definite inspection and overhaul schedules should be set up for the maintenance crew and completion reports made on work done, breakdown corrective measures, condition of machinery, supplies needed, etc.

3. REPLACEMENT PARTS — Costly shutdowns are held to a minimum by having an adequate supply of replacement parts on hand. This is only too well emphasized when the failure of a specially designed machine part requires a distant factory replacement. Repair and replacement supply parts should be in a location readily available for use.

4. LUBRICATION — Maintenance lubrication should be allotted special attention as a separate maintenance problem. Either the machine operator should be given complete lubrication responsibility or, if warranted, have a special lubrication man handle the assignment. In a new installation the specific mine conditions such as mine water impurities, rock characteristics, mine temperature or other operating conditions often require special lubricants and care.

5. MAINTENANCE EQUIPMENT—Each machine operator should have the proper tools and supplies quickly available for on-shift minor maintenance and adjustments. The maintenance crew should be equipped to take care of all contingencies on short notice with on-the-spot repairs being of prime importance. Attention should be given to acquiring special maintenance tools and equipment to fit local operating conditions.

6. OFF-SHIFT MAINTENANCE — In mechanization operations every effort should be made to accomplish regular maintenance, lubrication and repair work on off-shift or non-production time. Such work that requires shutdown of the machine should be done before or after the regular production shift or during regular lunch hour. Even overtime premium labor cost is more economical than penalizing the production output by unnecessary shutdowns.

7. MAINTENANCE COSTS—Quite logically, the introduction of additional machinery in mechanizing may be expected to increase the maintenance cost per ton. This increase will usually range between 3 and 5 cents per ton. In actual practice it has been found that mechanization, with its

favorable possibilities for concentration of workings, track elimination, lessened pumping requirements, replacement of obsolete equipment, etc., will usually end up with a lower mine maintenance cost than originally anticipated.

Depreciation

Depreciation charges—along with interest, obsolescence and taxes—are usually handled on a standardized percentage basis by the cost and accounting departments of the operating company and might be either a per ton or time period charge. In estimating possible savings with a mechanized mining installation, allowing five years for writing off the initial cost should result in a conservative figure for net savings per ton when all the costs are balanced.

Safety

While mechanized mining introduces new machinery and added electric power hazards it has been proven in the coal mining industry that properly installed and supervised mechanization normally results in improved safety records.

The following are important items in mine mechanization both from safety and operational angles:

1. ELECTRIC CAP LAMPS—The elementary fact that a miner needs a good light is unassailable. Modern electric cap lamps are a comparatively cheap investment for added safety and efficient operation.

2. CABLE VULCANIZING—Despite the best precautions, portable machinery power cables do get broken or wear out. Instead of splicing—which is hazardous at best—a spare cable should be kept readily available for replacement and the bad cable reconditioned by vulcanizing. Long cables can be sectionalized with proper connectors to facilitate replacement.

3. GROUNDING—Machinery should be grounded in accordance with state and federal recommendations.

4. MACHINE HAZARDS—Study and correction of safety hazards introduced by each new machine should be a continuous objective.

5. TRAINING — Machine operators should be instructed and trained in the proper operation of their machines.

6. TELEPHONES—A close-up telephone installation at the working place will facilitate treatment of injuries and minimize operational breakdowns.

Supervision

Constant, efficient supervision is the key to smooth-operating, high-production, low-cost mechanized mining. There is no substitute for good supervision. Sometimes the new problems and inherent difficulties of a new mechanization installation overwhelms the older type mine supervisor. However, if he has the intelligence, believes in the success of the new method of operation, and is willing to put forth the added effort, he can become a good mechanization supervisor. On the other hand, if the "old timer" follows the pattern of the Welsh miner, who refused to use the new-fangled shower-bath because the water spray "weakened his back," there is no alternative but to put the mechanization supervision in the care of a younger, more aggressive supervisor.

A mechanized mine supervisor or foreman will have fewer men to handle than with a hand-loading crew, but his job will call for more intelligence and organizational ability. Recognition of supervisory ability is every bit as important as the selection and investment in the mechanization equipment.

Mobile loading machine in 42-in. gypsum seam. Overall machine height is 26 in. with 17 in. conveyor pan height. Complete length of 12-ft. swinging discharge conveyor boom not shown

Handling Impurities

Many gypsum mine operators immediately dismiss the possibilities of mechanical loading savings, contending that the impurities present in their seam require hand-sorting to produce a quality product. In a majority of these cases, an economical solution of their particular impurity handling is available by plant beneficiation, thus opening the way to mechanical loading and its resultant savings. The gypsum industry has lagged behind practically every other type of mining production in plant beneficiation of impurities in mine-run rock. The usual gypsum industry method is to hand-sort in the mine with only elementary impurity removal in the plant. Considering that gypsum mine hand-loading costs usually run from 25c to more than 40c per ton labor and will amount to 30 to 60% of total mine labor cost, mechanical loading offers the outstanding savings possibilities in gypsum mine operations.

Air Separation

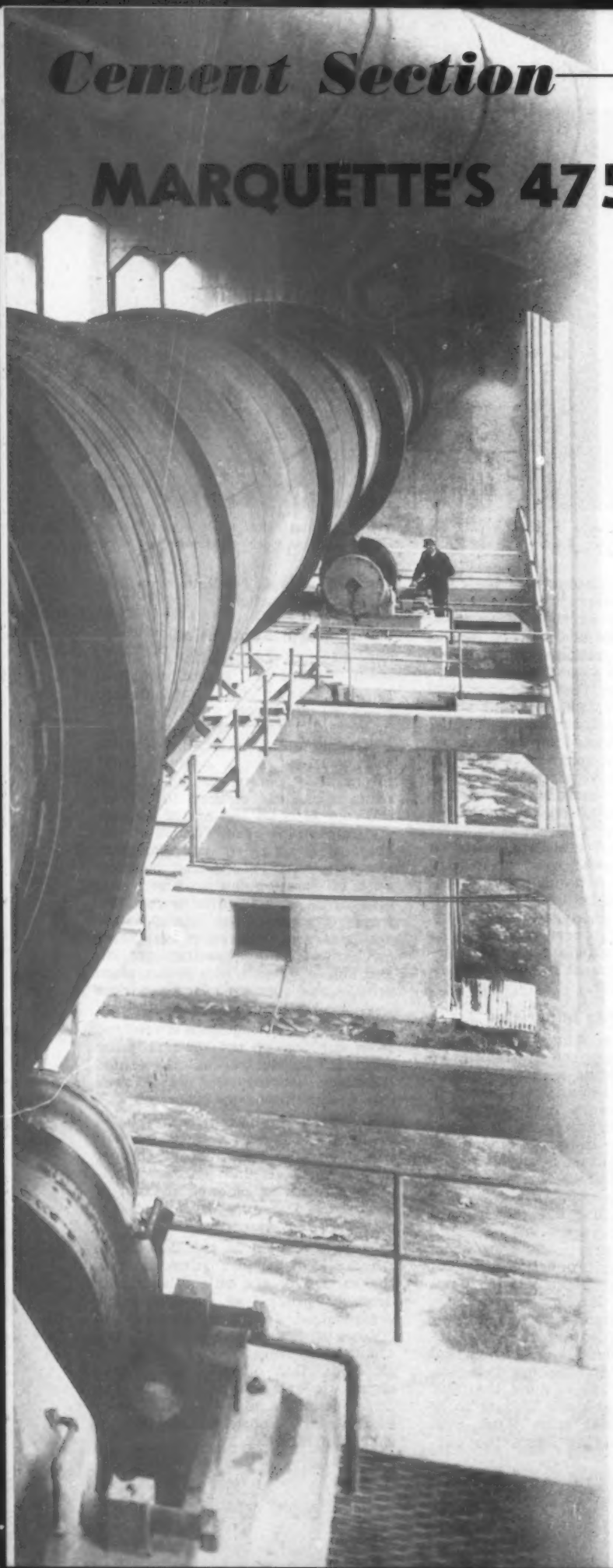
A mine in Ohio, with a parting seam of shale and dolomite midway in the gypsum face, mechanically loads the mixed rock and beneficiates by air separation in the plant circuit. In the same district, mining another seam with a weak dolomite roof, mechanical loading is possible by using a blasting method that keeps the roof falls on top of the gypsum and removing by hand ahead of mechanical loading. Actual pilot plant test runs have proven that beneficiation by flotation can produce a 95% plus purity rock from mine-run 72% purity gypsum. Thus air, flotation and electrical separation can make mechanical loading savings possible and actually result in a better plant product and open up a larger market.

At a Michigan mine a 2½-ft. dolomite-shale parting seam is removed from the top of the lower gypsum seam by an electric-motor-operated bulldozer shoving the waste rock into nearby mined-out workings.

Accepting the basic premise that a mechanical loader is most efficient when loading continuously, proper mining methods and plant beneficiation can tip the balance in favor of mechanical loading even in low grade mining seams.

From the moment the decision is reached to install mechanized mining, the success of the enterprise vitally demands high-type assembly-line organization from management to crusher discharge. The goal of mechanical mining should be 100% shift-operation of the loading machine—removing or minimizing the obstacles in the path of this achievement is the constant objective of efficient operation.

MARQUETTE'S 475-ft. Rotary Kiln



Longest kiln has excellent performance in burning extremely uniform product; mud rings and slag rings no problem in operation under closely-controlled burning conditions with aid of instrumentation

By BROR NORDBERG

More than four million barrels of portland cement clinker have been produced by the 11½- x 475 ft. rotary kiln of Marquette Cement manufacturing Co. at its wet process mill in Des Moines, Iowa, and apparently with very excellent performance. After five years in production, operating data reveal that the kiln, longest in the western hemisphere, has excellent fuel efficiency (burning a low grade of coal) and that it has high capacity of an extremely uniform product, far superior to that produced in the short kilns which it supplanted. The mill, with its single long kiln, was designed to manufacture 1,000,000 bbl. of portland cement per year—standard, high-early-strength and air-entraining.

Operation of the kiln and its performance, after all this experience, are to be discussed herein, along with a description of the kiln and its related operating equipment and control devices, after a consideration of factors that led to its selection.

Why the Long Kiln?

When Marquette purchased the Hawkeye Cement Co. in September, 1940, the mill was scheduled for early major rebuilding, in nearly all departments. The plant had six 8- x 125-ft. wet process kilns at that time with a waste heat power generating plant, and had a total production of 3000 bbl. of clinker per day. Those kilns were extremely inefficient. They were operated, like many kilns are, at the expense of fuel efficiency as cement kilns, for the purpose of maximum generation of electrical power from waste heat gases. Kiln ring formation in these short kilns, which could not be operated to greatest advantage in the production of clinker and still devlop adequate power from waste heat, was serious and a great amount of down time was required for removal of rings.

Quality of local Iowa coals and the improved efficiency of modern, independently-operated power generating plants led to the selection of the single, long rotary kiln and installation of a separate coal-fired power-generating plant, so that both could be operated to best advantage. It is of interest that, based on a power rate of 23.5 kw. hr. per bbl. of cement, the power department consumes 420,000 B.t.u. per bbl.

Left: Partial view of all-welded, 11½ x 475-ft. kiln

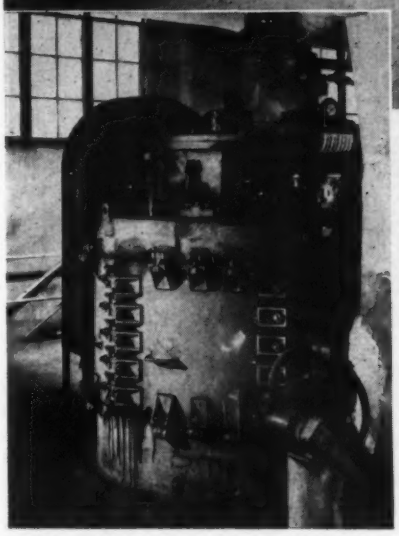
Length of the kiln and its diameter were based upon the time required for the conversion reactions, of evaporation and drying, calcination of $MgCO_3$ and $CaCO_3$, the reaction between solid oxides and clinker formation, to give the expected capacity with maximum utilization of heat from coal that is far inferior to grades burned throughout the industry.

Iowa coal, as available for cement manufacture, has 17 to 18 percent ash, dry basis, and over 5 percent sulphur. Its heat value is only 9300 to 9500 B.t.u. per lb. A coal of high volatile matter, it gasifies at low temperature and more than average time is required for maximum heat transfer to cement raw materials; hence a long kiln is desired, fired with a flame up to 90 or 100 ft. in length. Coal is pulverized to a fineness of 65 to 67 percent minus 200-mesh, relatively coarse, when the kiln is in normal production, assuming 15 percent or less contained moisture, to project a long flame, extending maximum heat to the back end of the kiln.

The Kiln

The kiln is of all-welded construction, of Allis-Chalmers manufacture, and is lined with heat insulating brick except for the back 40 ft. of length. It rides on seven sets of 48- x 24-in. forged steel rollers. Fabricated from ¾-in. steel plate, with 2-in. plate under the tires, the kiln weighs 1600 tons including heat transfer chains in the back of the kiln and the 14 carloads of brick required to line it. It is direct-fired by a unit coal mill, with preheated primary air taken from the kiln hood and secondary air from an air-quenching clinker cooler, has the rate of slurry feed synchronized with the kiln speed which is variable, has sufficient heat exchanger chains to give the advantage of a probable additional 100 ft. of kiln length and has an instrument contral panel, with instruments for practically every measurable factor in kiln operation. Firing is under induced draft and there is a positive seal, by air under pressure, at the kiln hood, which is a very important factor in maintaining constant draft conditions throughout the kiln.

Above: Firing floor is provided with instrumentation for almost every firing factor, either indicating or recording. Pyrometer focuses at far end of flame and serves as an indicator. Above kiln may be seen piping for withdrawal of heated air for pulverizing coal



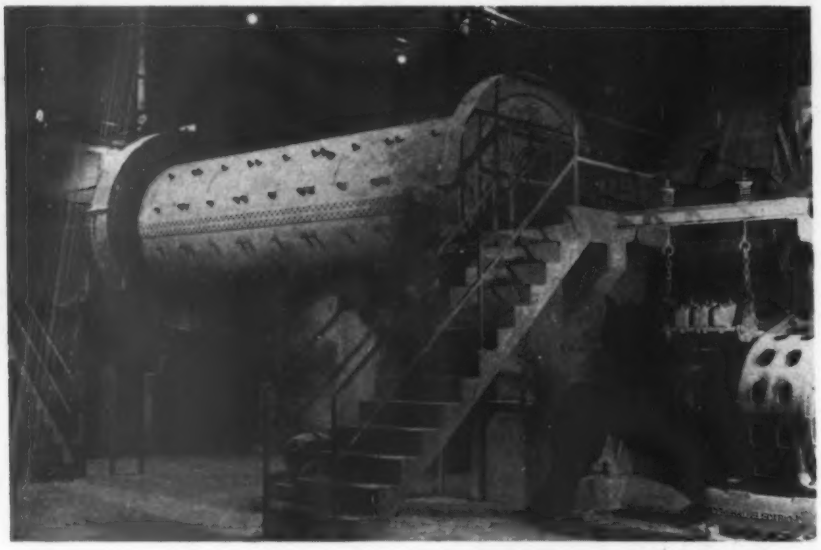
Left: Unit coal mill for firing rotary kiln

Kiln performance cannot be considered, as such, without reference to the balance of the plant since other departments, particularly the raw grinding mill, are tied closely to it by design. For example, extremely uniform slurry is obtainable through meticulous blending of slurry in the raw mill which is reflected, in part, in clinker that is exceptionally uniform in composition. An extremely long kiln is, of course, a good blending machine in itself.

The kiln has proven a very sensitive apparatus — one that requires close supervision by skilled burners, who have at their command a myriad of indicating or recording instruments and automatic controls. Variations in coal, due to segregation and fluctuating moisture, for example, are the burner's responsibility for adjustment in firing. The importance of the skill of the burner cannot be overestimated with such a long kiln; a short period of off-firing will be reflected in production over a period of hours—some four hours (1.8 bbl. per revolution) being consumed in passage of raw materials through the length of the kiln.

Operating procedure is far different than it was in the beginning. The kiln has been the object of continuous experiment from the time it started operating, directed toward improving economics as a heat exchanger and toward further product improvement. Every conceivable variable in burning has undergone experiment and change, and the holding points on firing temperatures, draft, kiln speeds, etc., today are the result of plant experience and could well be subject to further change with further experience. There have been physical changes, as well, for example, in the amount of heat transfer chains suspended in the back end of the kiln which are closely related to exit stack temperatures, draft, dust loss and the formation of mud rings.

Airplane view of the plant. On left, paralleling each other, are raw materials storage building, raw mill and kiln building



One of the tube mills in raw mill, open-circuit stage grinding

At present, the kiln is burning 3100 to 3200 bbl. of standard clinker per day, which, with changes in the kiln drive mechanism, will be increased to 3500 bbl. That peak has already been reached on experimental runs. Fuel consumption is at the rate of 1,081,000 B.t.u. per bbl. on an average, and the exit gas temperature is held in the neighborhood of 420 deg. F.

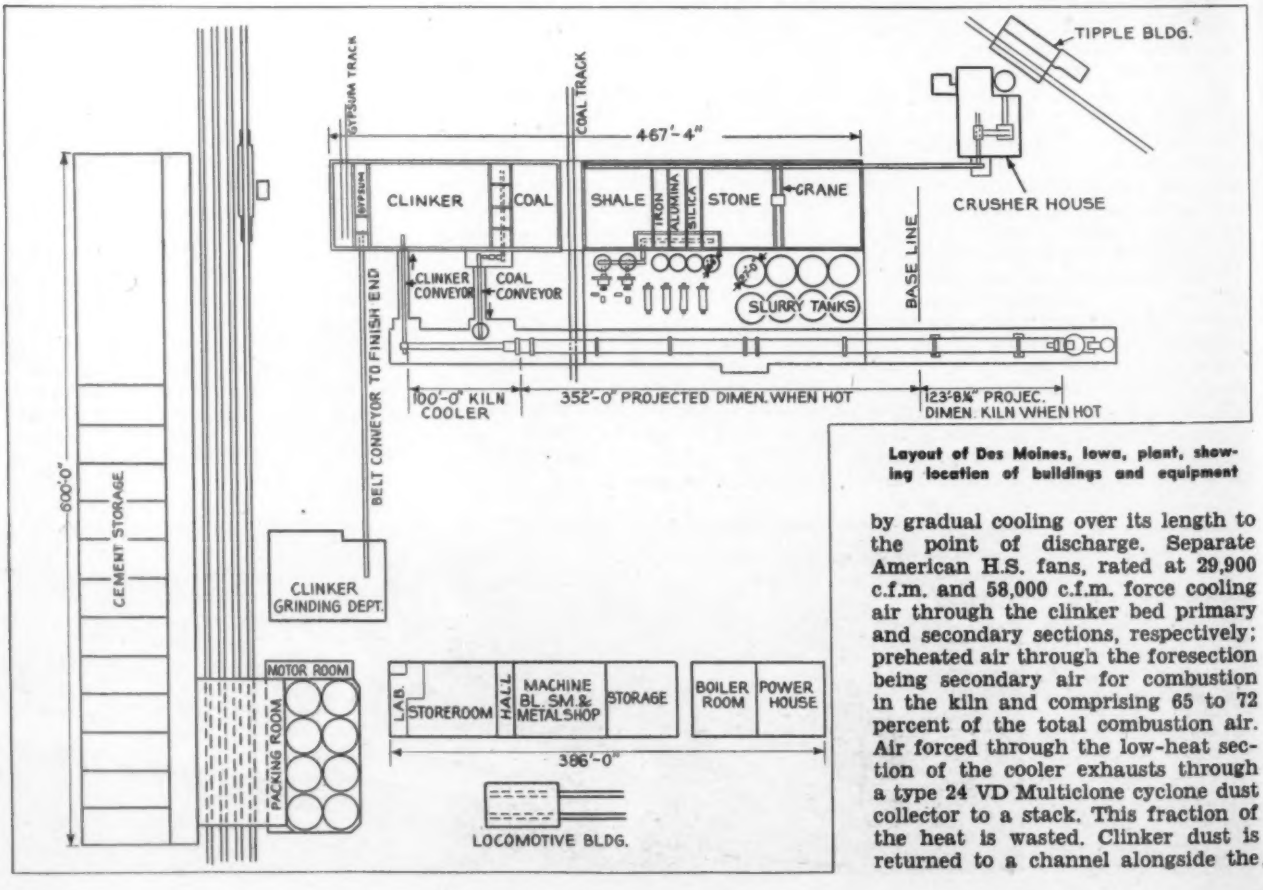
Kiln Feed Control

Slurry is fed into the kiln by a motor-driven Allis-Chalmers ferris wheel feeder operating through a synchronous tie with the kiln drive motor and speed changer that automatically adjust the rate of feed according to kiln speed. The kiln has variable speed within limits of 20 r.p.h. to 80 r.p.h. It is driven by a 125-150 hp. Allis-Chalmers d.-c. electric motor through V-belt and a 13DD Falk gear reducer. A small generator driven from the kiln motor actuates a 5-hp. d.-c. motor that drives the ferris wheel feeder. Adjustments in speed of the feeder are effected by a variable pitch type speed changer. At the present production rate, the kiln speed averages approximately 67 r.p.h. Higher production up to the 3500 bbl. per day goal already reached, probably will be the standard, with installation of an identical kiln drive, tied electrically with the existing one into a dual drive. Higher kiln speeds will be adopted, probably in the neighborhood of 80 r.p.h.

The kiln has a pitch of 7/16 in. to the lineal foot. At the average speed of 67 r.p.h., travel of the cement materials through the kiln is approximately two lineal ft. per revolution of the kiln. Clinker is burned at approximately 2600 deg. F. and at slightly higher temperature for high early strength cement. It discharges over a 4½- x 100-ft. Allis-Chalmers grate-type, air-quenching clinker cooler said to be the longest of the type in the industry.

Firing

The cooler is divided by a curtain into primary and secondary cooling sections, quick quenching to about 1000 deg. F. taking place over the first 15 to 18 ft. of cooler, followed



Layout of Des Moines, Iowa, plant, showing location of buildings and equipment

by gradual cooling over its length to the point of discharge. Separate American H.S. fans, rated at 29,900 c.f.m. and 58,000 c.f.m. force cooling air through the clinker bed primary and secondary sections, respectively; preheated air through the foresection being secondary air for combustion in the kiln and comprising 65 to 72 percent of the total combustion air. Air forced through the low-heat section of the cooler exhausts through a type 24 VD Multiclone cyclone dust collector to a stack. This fraction of the heat is wasted. Clinker dust is returned to a channel alongside the

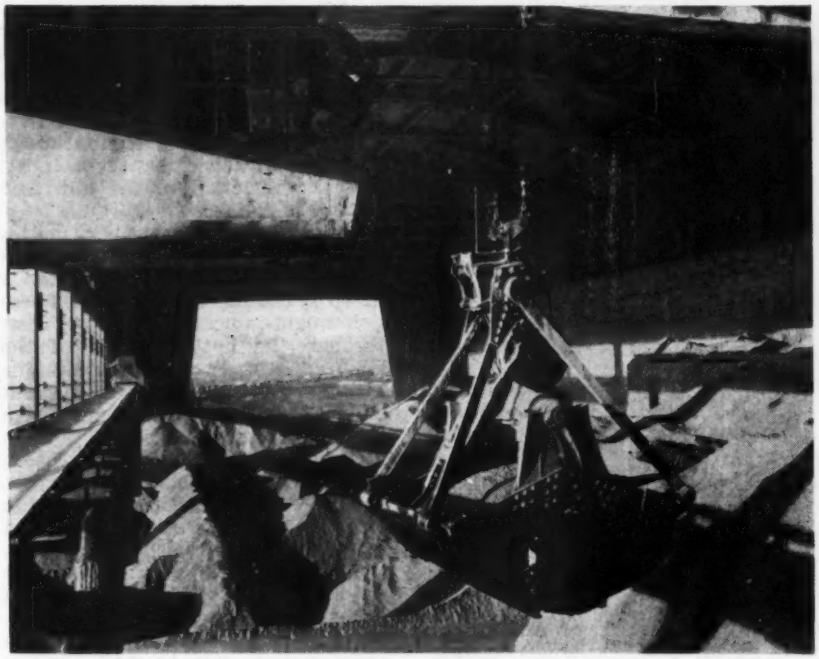
clinker grate, so located that the dust is not recirculated to the collector.

The fans are driven by 30-hp. Allis-Chalmers squirrel cage motors through V-belt and the grate drive is an automatically-controlled 15-hp. Allis-Chalmers motor. A Shallcross automatic rheostat control in the drive motor circuit speeds up or slows the speed of the cooler grate with rises or falls, respectively, in the pressure through the clinker bed. Clinker is cooled to the point where ½-in. size or smaller actually is cool at the point of discharge over a bar grizzly to a belt conveyor. Pieces as large as a walnut may be held in the hand. Purpose of the bar grizzly is to reject any pieces of slag ring as they become discharged. Incidentally, no difficulty is experienced through slag ring formation, probably because of the large kiln diameter and a high silica content in the raw mix. Clinker is conveyed into covered storage over a 24-in. x 212-ft. Imperial Belting Co. "Sahara" heat resisting conveyor belt, an asphalt impregnated, asbestos, stitched belt. A Merrick Weightometer continuously records the production.

Firing is done by an E-56 Babcock and Wilcox direct-firing unit mill which, as stated earlier, is set to pulverize to a fineness somewhat coarser than ordinary when coals of higher heat value and containing less ash are burned. Primary air, 28 to 35 percent of the total for combustion, is drawn from above the kiln hood and tempered to 400 deg. F. entering the mill. The coal-air mix is approximately 120 deg. F. entering the kiln through an air-cooled burner pipe. Temperature is increased to 140 or 145 deg. F. in wet weather.

The coal mill is driven by a 100-hp., 870 r.p.m. G.E. induction-wound motor; the fan by a 150-hp. d.-c. motor with a variable speed range of 1150 to 1750 r.p.m. Grinding capacity is 18,000 lb. per hour. Through the master electrical control board on the burning floor, the coal feed, primary air volume and temperature may be varied by the burner. Volume of air is varied automatically with changes in coal feed to the mill, through pressure differential.

Important to holding draft conditions constant throughout the kiln is a 11-ft. 6-in. double air-seal nose ring, that seals and cools the firing end of the kiln. An independent blower unit forces air under slight pressure at 300 c.f.m. around the castings and nose block, entering the kiln as a small part of the secondary air to support combustion. The drive on the fan is interlocked with the fan on the coal mill so that the coal mill fan cannot be started until the air seal is operative. In effect, the kiln is a closed furnace.



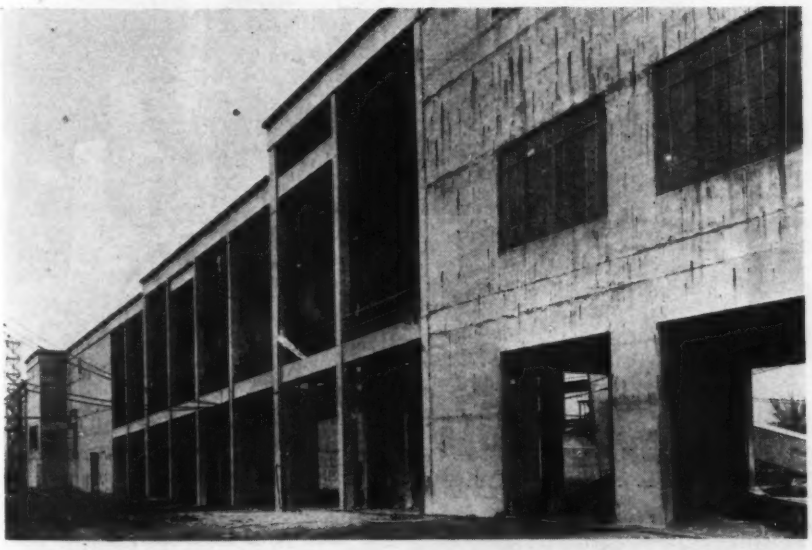
Overhead clamshell in action in raw materials storage building. Note reinforced concrete construction throughout, including roof. Traveling tripper conveyor, placing crushed stone in storage, may be seen to the left

Kiln Lining

The kiln is lined with refractory block except for the back 40 ft. of length, 35 ft. of which is in the chain section. Lining from that point forward, into the zones of increasing temperatures, consists of 72 ft. 8 in. of 4½ in., 40 percent alumina wear-resisting block (chain section); 69 ft. 5¾ in. of 6 in. 40 percent alumina brick; 196 ft. of 6 in. 40 percent alumina brick with 2½ in. thickness of 6- x 30-in. Superex insulating block set in semi-refractory cement; 38 ft. 9 in. of 9 in., 70 percent alumina brick; 41 ft. 2 in. of 6-in. magnesite brick; 13 ft. 9 in. of 9-in., 70 percent alumina brick with 70 percent alumina kiln nose block. The life of magnesite basic brick in the hottest zone, still not extensively employed in the industry, has proven satisfactory. By the simple process of increasing the coal or reducing the primary air input to the kiln, and thereby increasing the CO in the gases, an 8-in. protective coating is built up on these brick in a matter of a few hours.

Conditions in the back end of the kiln are all-important in combustion control, and whatever is done at the front end is interpreted in terms of conditions in the back end of the kiln.

Section of kiln building near feed end



Taking a sample of exit gas

Originally the kiln was equipped with 19,600 lineal ft. of Allis-Chalmers ⅝-in. heat exchanger chains extending through 105 lineal feet of kiln length in the drying section. There will be a reduction to 90 ft. of ¾-in. chain, some 12,000 lineal ft., when the kiln is shut down for major maintenance. Life of the chains is nearly four years in this kiln.

Positioning of the chains and the amount, of course, have a bearing on draft resistance, the amount of dust carried in the exhaust gases, the amount of fuel saved, stack temperatures and other operational factors such as the control of, or elimination of, slurry mud rings.

In this particular kiln, the formation of mud rings has been completely eliminated through regulation of the slurry viscosity through the chain section. Some difficulty had been experienced, earlier, with the formation of mud rings back in the chain section, now eliminated through causing the viscosity that inhibits ring formation to occur at a definite point in the kiln, within a few feet of the end of the chains where the whipping action of the links will dislodge the nodulized material as fast as it deposits. The tendency had been for rings to start building behind the fittings from which the chains are hung inside the kiln. This critical point in viscosity, when the slurry is sticky and will form rings in the presence of great quantities of dust, is at 17 to 19 percent moisture.

Feed into the kiln is a slurry containing 37½ to 38½ percent moisture, which is the ideal, based upon best periods of running, but has variations according to requirements of the slurry pumps in the raw mill. The amount of contained water in the slurry, as handled by pumps in the raw mill, is not important; the objective being the best consistency for efficient handling. Variations in consistency may be due to water leakage through the seals of the slurry pumps or become necessary with variations in the raw materials or in fineness of grind, which normally is held at 91 percent through 200 mesh. Chemically, there is almost no variation in the kiln feed material.

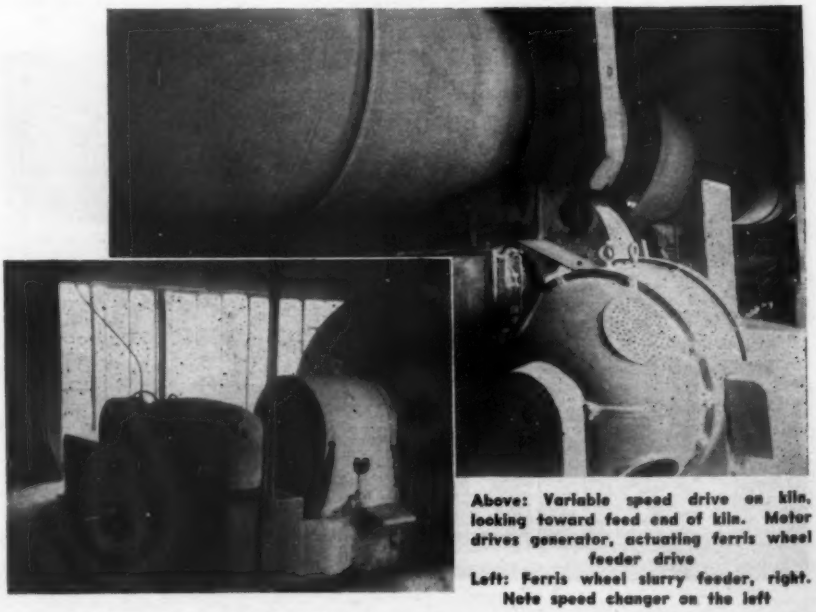
Control of mud rings is a matter of controlling viscosity with minimum sacrifice of heat. Too dry a material coming from the chain section would indicate wastage of heat through the hotter section of the kiln and result in excess dusting. The holding point is 12 to 17 percent moisture as the material comes from the end of the chain section.

Eight ports, 2⅞-in. sample holes, through the kiln shell, starting at about 5 ft. from the unlined section into the bricked section and spaced at 9- to 10-ft. intervals longitudinally, are the means of guarding against flooding conditions and mud ring formation. A complete check of viscosity reduction, through the entire chain section, may be made, and is always made after a kiln change. No dust collection is provided, but gases coming out of the very short kiln stack are remarkably clean to the eye. From one to two bbl. of dust per day is all that is precipitated in a large dust chamber housing ahead of the stack.

Draft—Instrumentation

The kiln is fired under induced draft, the fan being a Bayley blower rated at 150,000 c.f.m. at 4-in. static pressure, driven by a 200-hp. G.E. slip-ring induction motor of 200-900 r.p.m. speed range. There are automatically-controlled louvre dampers on the fan inlet connections. Draft on the kiln controls the volume of secondary air for combustion, draft being maintained at 0.2 in. at the hood and minus 2 in. at the stack outlet. Hood draft control is considered the most important single regulatory device in firing the kiln. Firing is done with slight excess air to prevent too rapid coating in the kiln, a typical analysis of the exit gases (420 to 440 deg. F.) registering zero CO, 0.7 to 1 percent O_2, 26-28 percent CO_2 and less than ½ of 1 percent free CaO. Stack temperatures could be reduced further insofar as the kiln is concerned, but a safe margin against condensation is desired.

The kiln being a sensitive apparatus with many variables in firing, and long time lag, the theory of operation is to develop as nearly ideal firing conditions as practicable and to have sensitive control, through a rheostat, of kiln speed. Otherwise, with constant kiln speed, required adjustments in other factors, i.e., hood or back end draft, primary or secondary air, coal variables, etc., would throw off the accurate balance desired. In starting the kiln, practice is to set the kiln speed at approximately the correct figure, bring the other variables as close to the ideal balance as practicable to stabilize the fire and then make the necessary minor kiln speed changes. Kiln speed may be changed anywhere between 20 and 80 r.p.h. in increments of 1 r.p.h. or less from the master control panel at the kiln hood, the compensating change in speed of the ferris wheel feeder being very slight for kiln speed changes of less than 10 r.p.h. It is said that approximately three days is required to bring the kiln up to normal production, in stabilizing the firing variables while permitting gradual brick expansion to fill the shrinkage between the brick



Above: Variable speed drive on kiln, looking toward feed end of kiln. Motor drives generator, actuating ferris wheel feeder drive

Left: Ferris wheel slurry feeder, right. Note speed changer on the left

fill the shrinkage between the brick and shell, which occurs in cooling.

Exit gas temperatures are held uniformly, also the coal-air temperature, and clinker temperatures are controlled through litre weight tests* (for hardness of burn) made at intervals. The burner has the responsibility for adjustments due to variations in coal quality and the moisture it carries. As an indicator of kiln temperatures, a Leeds-Northrup Ray-o-tube pyrometer sighted on the clinker at the far end of the flame records temperatures at that point, dusting prohibiting sighting of temperatures within the hottest zone. High-early-strength clinker is burned a little harder, with a higher lime raw mix.

Instrument Controls

The master control electrical panel for kiln operation, designed by Marquette and largely of Leeds-Northrup instruments, is one of the most complete in the industry. The list of indicating, recording and automatic devices includes the following:

1. Micromax burning zone temperature (indicating and recording).
2. Automatic draft control.
3. Clinker production (recording-weightometer).
4. Three-pen draft recorder (unit coal mill).
5. Kiln revolutions counter.
6. Slurry wheel counter.
7. D.C. Amps. to generator on kiln motor (indicating).
8. A.C. Amps from generator (Synchronous tie).
9. A.C. Volts from generator (Synchronous tie).
10. Kiln speed, r.p.h. (indicating and recording).
11. Feed and temperature recorder (stack-recording).
12. Two-pen draft recorder (firing and feed end).
13. Cooler pressure manometer (indicating).
14. Manual-Automatic cooler control (Shallcross).
15. Temperature recorder (air to coal mill, coal-air mix).
16. Air weight control to cooler (Foxboro automatic damper regulation).
17. Air temperature control to coal mill (Foxboro-automatic).
18. Mill level control (coal-automatic Bailey).
19. Damper position indicator.
20. Red damper position—full open (lights).
21. Red damper position — full closed (lights).
22. Green overflow flasher (Ferris wheel).
23. No. 1 cooler fan (light).
24. No. 2 cooler fan (light).
25. Rheostat for coal mill fan (control—manual).
26. Rheostat for kiln drive motor (control—manual).
27. Switch for induced draft fan.
28. Switch for Multiclone fan.
29. Switch for cooler drive motor.
30. Switch for coal mill air seal fan.
31. Switch for coal mill fan.
32. Switch for coal mill.
33. Switch for coal mill feeder.
34. Kiln amps (indicating).
35. Coal mill amps (indicating).
36. Push button for kiln motor.
37. Slow speed rheostat for coal feeder.
38. High speed rheostat for coal feeder.
39. Switch for forced cooling air to kiln firing end.
40. Switch for cooler secondary air fan.
41. Switch for sealing air fan (coal mill).
42. Clinker belt switch.
43. Red signal light for kiln and cooling fan.
44. Amber clinker belt flasher.
45. Green light for plus pressure on B & W air seal.

Power Plant

Electrical power is developed for the entire plant by a 55,000 lb. per hour B & W boiler developing steam at 450 p.s.i., 750 deg. F., to drive a G.E. turbine-generator set at 3600 r.p.m., which is rated at 5000 kv.a. in the development of 2300 volt energy. The boiler is fired by two B & W unit coal mills formerly used to burn clinker in the old kilns. Crushing plant and raw mill are staggered operations to hold down power demand. As stated earlier, the power department consumes 420,000 B.t.u. per bbl.

Plant Layout

The overall mill (excluding clinker grinding and packing which were not rebuilt) is a compact layout of structural concrete construction designed for efficiency in material handling. It consists essentially of three reinforced monolithic concrete buildings — a single, raw materials storage building 80 ft. wide, 470 ft. long and 65 ft. high; a raw mill building, 72 x 240 ft., 55 ft. high; and the kiln building of 30 to 45 ft. width and measuring 635 ft. in length, 47 ft. high. The buildings parallel each other with the raw mill building between the others. Structurally, the buildings consist of a series of transverse concrete bents supported on concrete columns at the wall line with high arched concrete roofs. Construction details were described in Rock Products and in other trade magazines shortly after the rebuilding program was completed.

Eight storage compartments, for limestone, silica, diaspore, iron, shale, coal, clinker and gypsum are provided in the raw materials storage building, with capacities for 18,000 tons of limestone, 30,000 bbl. of clinker and lesser amounts for the other materials. Raw materials are brought in by belt conveyor from the nearby crushing plant or by rail in the case of coal, gypsum and diaspore, etc., with a P & H 75-ft. span overhead craneway for handling and rehandling with a 3-cu. yd. Blaw-Knox bucket.

Raw Mill

The raw mill is unique in that auxiliary reinforced concrete slurry tanks for high lime, high silica, high iron and high alumina materials had been provided for adjustment, or correction, of slurries in the regular slurry tanks, and in the large capacity, both in slurry storage and handling pumps, to affect uniformity in composition through thorough inter-mixing and blending. There are eight reinforced concrete tanks of 2000 bbl. capacity each, measuring 25 ft. 6 in. diameter by 39 ft. high, arranged in four pairs, and five auxiliary tanks of 700 bbl. capacity each, total capacity being sufficient for four days of plant operation. Morris 4-in. and 8-in. slurry pumps, respectively, are the means of conveying and blending.

Five 80-ton feed bins, for limestone (2), iron, diaspore and shale, with Hardinge interlocked constant-weight feeders and located in the raw storage building are the source of feed to 50-ton feed bins, each serving an Allis-Chalmers 5½- x 9-ft. Preliminator. Poidometer feeders and constant pressure water meters are the regulatory devices to the mills. The mills, each driven by a 250-hp. synchronous motor through V-belt, are closed-circuited by 4-in. slurry pumps with separate 4- x 6-ft. Utah electric vibrating screens carrying 14-mesh rectangular mesh screen wire. Overs return into the mills by gravity while the unders are conveyed into a 450 c.f. agitated slurry tank. Four-inch pumps are the means of transfer to ferris wheel feeder tanks for four No. 18 F. L. Smidth tube mills which grind to 90-91 percent minus 200-mesh in open circuit.

Normal practice is to pump the product into the first pair of large slurry tanks, except when "special adjusting" slurries are ground, for blending. All tanks have Minogue mechanical and air agitators. Special adjusting slurries would be transferred into the second pair of large tanks for intermixing with the regular slurry after its transfer to that pair of tanks. The third and fourth pairs constitute storage for kiln feed after sampling and holding for complete analysis. Intermixing can be done between any of the tanks through a flexible arrangement of 8-in. high capacity slurry pumps.

The quarry is at Earlham, 30½ miles southwest of the plant. The

(Continued on page 119)

*Litre test is a plant weigh test to check clinker density.

What Cement Executives Are Thinking

Pricing, air-entraining cements, plant rehabilitation and fine-ground cements discussed—much diversity of opinion

APPARENTLY, fairly general operating losses incurred by the portland cement industry during 1945 have not changed, to appreciable extent, the views of the industry insofar as it has planned rehabilitation and improvements to plant facilities. This question was one of four that the editors considered timely and directed for comment to the executive heads of the entire domestic portland cement industry. The response to all our questions, summarized herein, is significant, for presidents and vice-presidents of operating companies representing 100 million barrels annual output, over two-thirds of what is considered normal production, replied to our letter.

Only one manufacturer, with a single mill of modest capacity, indicated that his views on plant rehabilitation had been seriously altered although a few reported a modification of plans for capital investment. Operating losses evidently are having the effect of stimulating plant building and rebuilding, rather than the reverse, in recognition of the fact that better operating methods and improved equipment design would tend to decrease operating losses. A high degree of efficiency in present plants is the goal, although current material shortages and labor difficulties are slowing actual work.

Some of the typical comments from the heads of cement companies, both small and large, follow.

A California concern expressed its stand in the following:

"A definite obsolescence factor induced by the government's policy of high wages confronts the cement industry in common with all industries in America. Under a policy of high taxes and high wages and a requirement that goods be sold at low prices, low profits must inevitably continue unless plants can be retooled to increase labor productivity and new economies in fuel, power and supplies."

The president of one of the large chain plant concerns said:

"Generally speaking, our views with regard to plant rehabilitation and improvements have not changed, and in practically every instance work is progressing to the extent permitted by the current material shortages and labor difficulties."

A midwestern concern with several mills expressed its plans as follows:

"Our views have not changed in regard to the immediate necessity for plant rehabilitation and improvements despite the generally low level of operating results for the year 1945. For further elaboration on our ideas in this connection see our annual reports for the years 1944 and 1945."

This company, in its annual reports, has provided for very extensive plant modernization.

The need for low cost processing was expressed by a leading large manufacturer in the following:

"Losses sustained during operations in 1945 have not changed our opinion in regard to plant rehabilitation and improvements. In fact such losses where sustained further emphasize the need of up to date mechanical processes."

A southern manufacturer, operator of a single mill said:

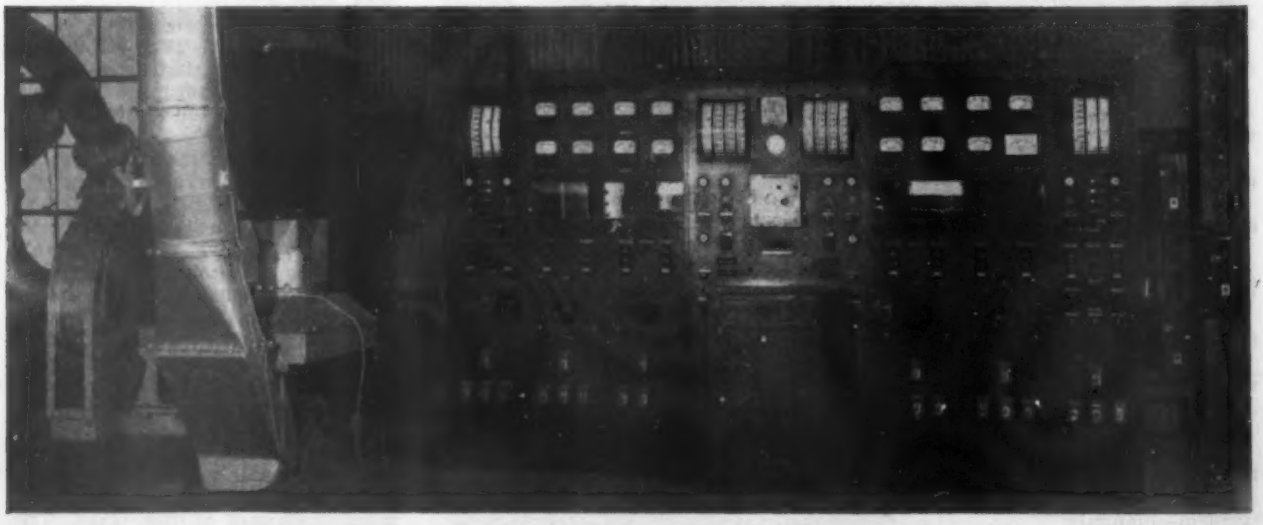
"Our views have not changed as to plant rehabilitation and improvements. In spite of the present demand, we do not think that it is a good time to expand production capacity but we think a high degree of efficiency in present plants should be aimed at."

Another large manufacturer, with multiple plants, said:

"We have been contemplating for some time an extensive rehabilitation and improvement program at some of our plants. It has been our hope to make these improvements at an early date. However, due to shortages of supplies and competent labor, we are now experiencing aggravating delays in the accomplishment of this program."

A midwestern manufacturer, expressing the need for plant rehabilitation, said:

"In general it is our belief that our company will be forced to spend money in the future for rehabilitation and modernization work. This rehabilitation program of ours has been under way for some time, but we are continually seeing needs and



Instrumentation controls will be given more emphasis in the building of new cement plants and modernization of older plants

opportunities for extension of our present program. As labor costs increase, it seems to us that better and more modern labor saving machinery must be employed if over-all costs are going to be held down."

Prices

Replies to our second question may hold only historical interest for, as this is written, OPA no longer exists; but there remains a possibility of its resurrection. We asked the probable effect of recent price increase allowances on 1946 profits and whether conditions had so changed that price relief already granted had proved inadequate. There was almost unanimous expression that adjustments in prices were entirely inadequate; that manufacturer's costs had increased more than authorized price increases. Labor increases and higher costs of coal and general operating and repair supplies evidently absorbed more than the price increases in many individual companies. Additional price relief was considered a necessity in the near future.

A few typical comments on the subject of prices, and profits, follow.

The president of a leading, large company said, in part:

"The increase in price ceilings on cement authorized by OPA will affect 1946 profits. Because, however, of increased wage rates and increased costs of raw materials and of practically all supplies purchased, especially coal, and increased freight rates, we believe additional price relief must be granted cement in the near future.

A southern manufacturer who found price adjustments far from adequate commented:

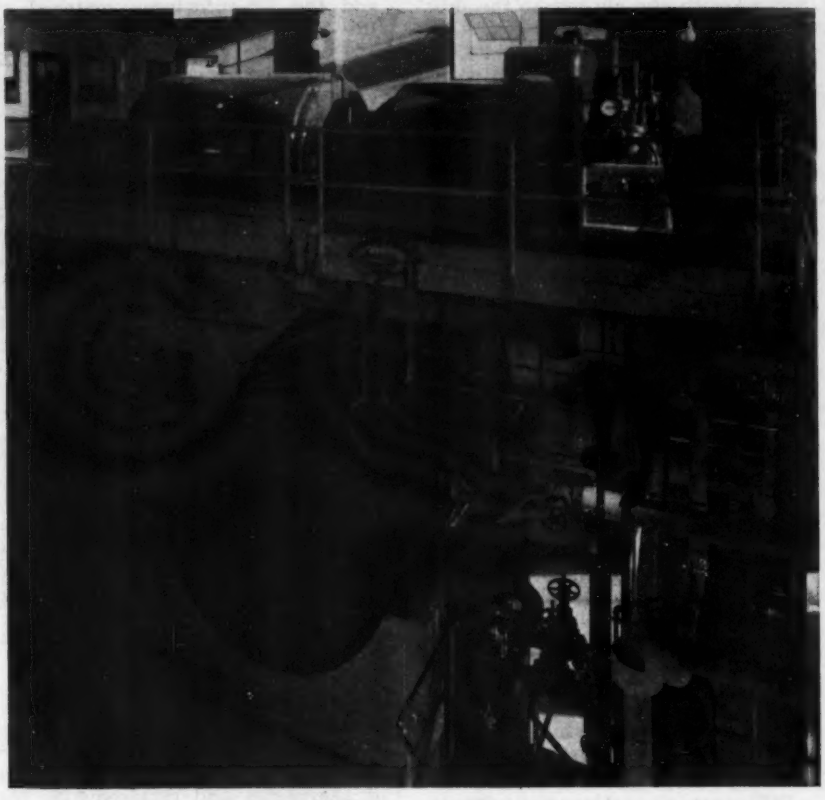
"The price increase in this district will help but is only about half what this company needs with conditions as they are at present. With what I can see ahead of us, I believe costs will continue to rise very rapidly so that the amount of price increase granted by O.P.A. will be entirely inadequate."

From California, the president of a leading concern wrote:

"Generally speaking, O.P.A. prices came too late to affect 1945 profits. Such increases were based on 1945 costs. The increase in cost of labor, fuel, etc., in 1946 has been, in my opinion, generally equal to the price increases allowed in 1945."

According to the president of one of the nation's largest companies, price increases granted were not reflected in increased prices for much of the cement shipped subsequent to relief granted by O.P.A. He said:

"The increases granted by O.P.A. to the cement industry were not granted on an industry-wide basis. They were granted after showing was made by interested companies by districts, and the districts selected by O.P.A. corresponded generally to the Bureau of Mines Districts 1 to 12, inclusive. Portland cement, as you know, is sold on the basis of future delivery, and therefore increases granted by O.P.A. could not be applied to shipments made during the period covered by specific commitments or contracts, even though these shipments were made after the O.P.A. increase was authorized. This is due to the practice of the industry of selling cement for future delivery on the basis of a fixed price. It is only within very recent times that our contracts have been amended to permit contract prices to be increased by the amount of any increase in freight or any increase in tax on freight or tax on sales. It is therefore safe to assume that much of the cement which moved subsequent to the increases granted by O.P.A. in 1945 did not reflect the increased price. Conditions in some areas of the country have changed radically, and in some areas the increases already authorized by O.P.A. are entirely inadequate."



Auxiliary power plant supplements waste heat boilers in modern cement plant

Another prominent manufacturer said:

"Your assumption is entirely correct. Price increases came too late in 1945 to make a noticeable difference in 1945 earnings. It is our opinion, however, that the increase will pretty generally affect the shipments for the year 1946. However, the 20-cent increase which was generally allowed by the O.P.A. does not begin to cover increased costs."

A midwestern manufacturer said, in part:

"About one-half of our marketing area was benefited in 1945 by increases in ceiling prices permitted by O.P.A. and our results for that year were helped to that extent. For the year 1946 we will have the full effect from increases in ceiling prices granted by O.P.A. over all of the marketing area in which we operate. This will be of some help in bringing about a better result despite further increases in production cost and other costs."

Another midwestern manufacturer commented:

"Going along with offsets for labor costs, is of course the need for higher selling price in this very basic industry. Very little price relief has been received by the industry and not enough to make up the increase in costs to which individual plants, and the industry as a whole, has been subjected. It is true, as you mentioned, that increased prices do not show their full effect for some six months after they have been put into execution. However, those that were put into effect in 1945 will show up in 1946."

Air-Entraining Cements

The editors, having heard much controversial opinion as to whether air-entraining agents should be added at the mixer on the job or inter-

ground with the clinker at the mill, from various sources and at many meetings that considered the subject, asked the heads of the cement industry why they should want to manufacture air-entraining cements, in view of recently-expressed opinion by some prominent engineers outside the industry that apparently more consistent results may be obtained from admixtures introduced at the mixer.

It is interesting that, from the standpoint of numbers of companies that commented on this much-debated subject, the majority believe, or prefer, that air-entraining admixtures be added in the mixer and become the purchaser's responsibility. From the standpoint of annual output, the vote was split approximately. It is also of interest that quite a few concerns assume a half-way position, believing that admixtures should become the purchaser's responsibility on large projects where qualified personnel is available to supervise and control the proportioning and mixing operations. On the other hand, they do not consider the small purchaser to be in position to assume responsibility for the control of air-entrainment and would recommend mill-manufactured air-entraining cement for that class of buyer.

Differences in aggregates, in their effects on degree of air-entrainment came in for discussion and a number of manufacturers, opposed to the mill-manufactured product, forecast the possibility that mills might have to acquiesce to the furnishing of several air-entraining cements with variable air-entraining properties, quantitatively.

Replies to our question had a decided competitive flavor; some manufacturers saying "We make it to keep up with the Joneses," or "Our customers ask for it" or "there is no reason at all why we should make it." Therefore, we have selected excerpts only from those letters that carried the least competitive comment and unbiased thinking on the subject.

Mill vs. Mixer Introduction of Air-entraining Agent

A midwestern manufacturer commented, in part:

"Air-entraining portland cement is not an all-purpose product; nor is the use of air-entraining materials equally effective with all cements. The air content of concrete made with the same aggregates will vary with different cements using the same quantity of air-entraining material. The air-entraining material required to produce a given air content in concrete will vary with different aggregates.

"For large jobs where facilities are at hand for accurate testing and proportioning and proper supervision, it is desirable, for the above reasons, to add the air-entraining material at the mixer. This, however, does not apply to the general use of air-entraining portland cements on jobs large and small where such facilities and supervision are absent.

"Air-entraining portland cements for many purposes are an improvement over straight Type I cement, and have many desirable features such as greater durability, enhanced workability, lower water requirement, less bleeding and are more economical in their use. Generally speaking, with new improved mill techniques for controlling air-entraining admixtures to portland cement, the manufacturers are able to control their product so that it performs, within safe and satisfactory limits, with the aggregates commonly used within their respective market areas.

"It is our belief that cement manufacturers will continue producing air-entraining cements because they are recognized as an improvement over Type I for many uses—and also for competitive reasons."

A Pennsylvania manufacturer commented:

"This is quite a mooted question. Aqueous solution (resin soap) of neutralized vinsol resin should be, in our opinion, put in at the mixer in controlled amounts to meet conditions of aggregates and requirements. No definite amount of entrained air in the cement can *be right* on two jobs one mile apart. The specifications of 16 percent plus or minus 4 percent tells the tale, right at the start. The manufacturer wants only to satisfy the customer and it seems will put in what amount of anything the buyer demands."

A company, advocating mill-manufactured air-entraining cement, takes this position:

"We do not know of any field data which support the questionable opinion which has been voiced that more consistent results can be obtained with admixtures introduced at the concrete mixer. The air content of air-entraining cement can be controlled within the desired limits during the manufacturing process. We have not experienced any trouble in this regard during the past seven years that we have been manufacturing this product. Since air entrainment adds materially to the durability and plasticity of concrete, we consider it a major improvement in the quality of portland cement. To ask the consumers to add an air-entraining agent at the mixer to improve our product would be similar to the producers of gasoline requesting their consumers to add anti-knock compounds to gasoline as it is used. In brief, we manufacture air-entraining portland cement because it is a greatly improved portland cement for use in general concrete construction."

A California manufacturer, apparently neutral on the subject, commented on reasons why manufactured air-entraining cements might be preferred, as follows:

"As you probably know, air-entraining cement is specified for concrete that is to be resistant to freezing and thawing and there is not much of this concrete required in our trade area, which comprises northern California. We have freezing and thawing action in the Sierras where only a small amount of cement is used and we are not too vitally concerned with air-entraining cements. However, A.S.T.M. tentative specification for air-entraining cement seem more desirable to cement producers than the addition of admixtures at the mixer.

"The data covering this subject are sufficiently incomplete so that one could take a position either for or against the proposition, depending on his prejudices or preferences. Just because the data have shown greater regularity with material added to the mixer is no proof that in the succeeding 10 years this will continue to be the case.

"We know of one job in the east where very expert service was employed for adding material to the mixer and after a full day's operation, having been unable to get any air into the concrete at all, other expert advice was sought. The explanation of the absence of air in the concrete was quickly found to be that during the first day's operations the experts were using a curing compound instead of vinsol resin solution as the admixture. While this seems to be a rather silly situation, it illustrates one important phase of the controversy over the best method of introducing air. If experts can go this far wrong, what can we expect from the average contractor's man in the thousand and one jobs done over a period of years. The cement manufacturer who is really desirous of improving performance of concrete roads by taking advantage of air-entrainment, where the exposure is such that air-entrainment is desirable, could well take the position that the future of concrete roads could best be served by close plant control of the amount of air-entraining agent added to the cement.

"On the basis of present information, it can be argued legitimately that a cement manufacturer deeply concerned as to the future of concrete roads will serve his own purpose better by giving his customers cement that is uniform as to the amount of air-entraining agent than to leave the customer to the hazard of human control at the mixer. By human control I include also so-called dispensing devices which can get out of order and can run empty before the management can discover that they have been running for sev-

eral hours without any air-entraining agent.

"It is my personal belief that even under the so-called best control such as might be expected on the roads of the National Parks built under the control of the Public Roads Administration there will be failures that will develop in attempts to add the admixture at the mixer. Another argument in this same direction is the opportunity which will be presented to promote many agents for use as field admixtures which will not be subject to proper control in the factory and on the part of the distributor even though the material itself may have shown under controlled tests that it will meet the requirements of the A.S.T.M."

A northern manufacturer commented:

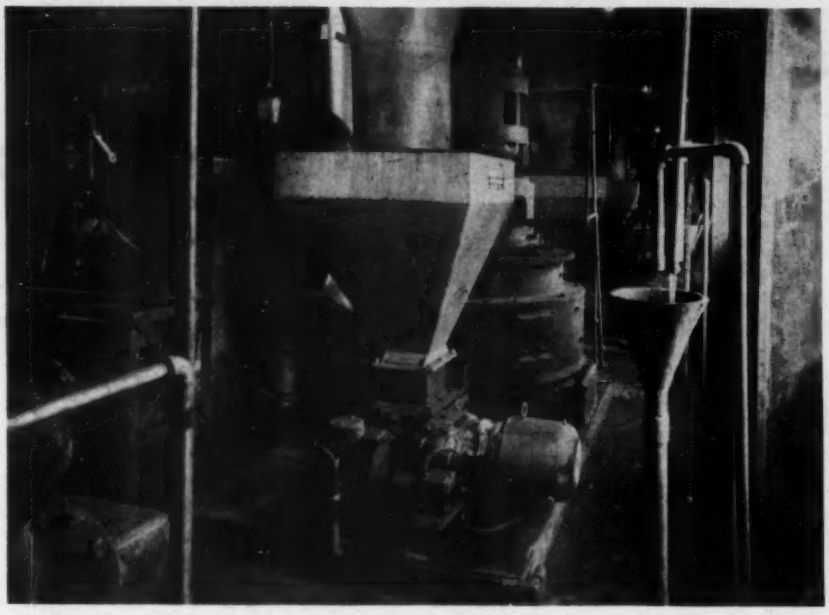
"Until recently it appeared to us that the use of neutralized vinsol resin would eliminate much of the non-uniformity in results obtained with air-entraining cements. We thought the use of neutralized vinsol resin would minimize the variations due to mixing time and aggregate gradation and proportions. This is apparently not the case. It was our impression until recently that a cement which met the A.S.T.M. requirements in mortar air content tests would give air contents in concrete within the relatively large range of 3 to 6 percent in at least 90 percent of the work requiring air-entraining concrete. We now feel that some of the difficulty in obtaining a reasonably uniform result may be due to the sand and it looks as though it would be advisable to study more thoroughly the effect that the *sand* may have on the air-entraining properties of concrete produced with air-entraining cement.

"For large contractors doing highway work where care is taken in the design of the mix and the source of the aggregates, it is entirely possible that it would be best to obtain the desired air content in concrete by the addition of the necessary air-entraining agent at the mixer.

"Tests have indicated that air-entrainment in concrete produces better concrete for almost any use and it would seem impractical for the small contractors and users to add an air-entraining agent at the mixer and obtain the correct results. For these users it probably is advisable to produce an air-entraining cement to get the proper air-entrainment for a high percentage of the jobs thus encountered."

A California manufacturer commented:

"Regardless of where admixtures are introduced, a high degree of control is required at the concrete mixer. Under these circumstances it seems undesirable to manufacture air-entraining cement at the plant and highly desirable to introduce the admixture at the concrete mixer under conditions of most rigid technical control."



Looking down at battery of direct firing coal mills in a middle western cement plant. More efficient utilization of fuel will call for additional installations of this equipment

Another of the very large manufacturers commented as follows:

"There is no factual information that proves that more consistent results are obtained when air-entraining admixtures are introduced at the concrete mixer. On the contrary, when air-entraining cement is furnished, a finished product with a controlled amount of air-entraining agent contained in the cement is furnished to the user. It is true that a given air-entraining cement will not produce the same amount of air with the different aggregates used in the field. On the other hand, however, the percentage of admixture added at the mixer would also have to be determined for each aggregate and each cement, and after this has been done it still depends on the human element to maintain the correct amount of addition in every mix produced."

A western manufacturer, with several mills, commented:

"It is true that better results from admixtures can be obtained when introduced at the mixer, if such additions are made under carefully engineered conditions. In our own opinion, however, many of the smaller jobs do not have the benefit of scientific control at the mixer and for such jobs it is our belief that an air-entraining cement manufactured within safe limits at the plant will produce more uniform results. In fact, it is quite possible that not only the air-entraining agent, but portland cement concrete itself might incur disfavor if, because of poorly controlled admixtures, the resulting concrete were to fail for lack of strength."

Another comment, from a manufacturer in the near south, was:

"We do not think that manufacturers of portland cement should want to make air-entraining cements at the mill. The best opinion seems to point toward better results through adaptability to local conditions by adding the air-entraining agent at the mixer. We think that if manufacturers continue to offer an air-entraining cement made at the mill they will soon be called upon for cements containing three or four different proportions of the air-entraining agent and that would mean a very great complication of storage bins, packing facilities, etc."

A manufacturer in the midwest commented:

"As an individual producer, we would, of course, like to see air-entraining agents added at the mixer, rather than by the manufacturer, unless the manufacturer were to sell the product for a sufficiently high price to cover the cost of material and labor required to introduce the air-entraining agents in the plant process. However, this is a situation where once started by any individual manufacturer, makes it almost definitely incumbent upon other manufacturers to do the same in order to meet a competitive situation."

Cement Ground Too Fine?

Some very interesting comment was forthcoming from executives of cement concerns in reply to our inquiry whether fine grinding of cement has been carried beyond the point where it results in a good all-purpose

(Continued on page 171)

MODERNIZE MILL AND QUARRY with Plant in Production

Giant Portland Cement Company converts stone dryer to utilize kiln waste heat, modernizes stock house, increases clinker grinding capacity, and steps up quarry production

By D. E. KOCH*

BY MIDSUMMER of 1943 the cement industry in the northeastern section of the United States saw the handwriting on the wall. Most of the government defense projects, air bases and camps were well under way, highway construction had disappeared, and very little private construction was being done. All this meant but one thing to the cement industry: namely, sharp curtailment in production. Most of all, the companies were faced with a possible shut down, or the conversion of the plants to the nodulizing of iron ore, the burning of lime, etc. Labor was beginning to become a problem, some cement workers being attracted to war plants paying higher wages; others found themselves in government-declared critical areas, where, if they left their job at a cement mill, they would be frozen in their war job for an indefinite period.

In June of 1943, at a meeting of the Board of Directors of the Giant Portland Cement Company, discussion centered around the possibility of making some plant improvements during the slack war period. At this meeting it was decided to make a start on about a half dozen jobs that could be done with a minimum of men and materials. All of the following projects were accomplished by our own men. At times we had only 70 men, including the packing department, besides operating the plant at a minimum of 25 percent of capacity during the entire war period, without a shut down.

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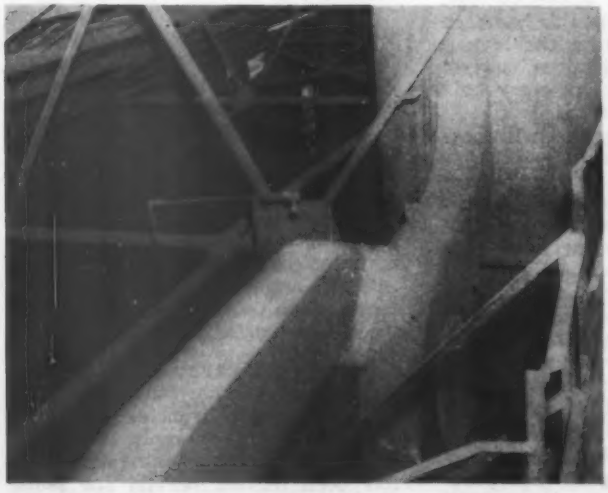
Dry Stone with Kiln Waste Heat

Since 1939, when the central coal system was discontinued in favor of unit pulverizers on each of the six kilns, a small No. 10 Strong-Scott coal pulverizer was provided in the kiln room from which pulverized coal was blown 225 ft. to the raw stone dryer. The coal was blown through a burner pipe to a dutch oven where it was ignited in a short, bushy flame. The heat developed was utilized in drying the stone. We also supplemented this with hot air drawn from No. 4 kiln housing by a fan through a 12-in. pipe into the dutch oven. This also provided pre-heated secondary air to aid in combustion. This system was not always adequate, for in the winter months when we encountered snow, ice and rain, there was not enough heat to completely dry the stone. Further, the coal for drying the stone was costing in the neighborhood of 2c per bbl. of cement produced. Even in 1943 the cost of coal was an important factor, and if this cost could be reduced, or eliminated, it would be well worth while.

With an ideal set-up to build a duct in the form of a "Y" from the housing of No. 5 and No. 6 kiln, it was decided we would try to utilize the waste heat from these two kilns to dry the stone. Later it was found that it could be done with one kiln, so that if one went down, we could switch over to the other kiln without interruption. After taking the temperature of the gases in the kiln housing, we were confident we had sufficient heat, for the gases ran from 1400 to 1600 deg. F., which was almost again as much heat as we had under the previous system. Recordings of the draft in the kiln stack and dryer stack were made under various weather and wind conditions, and from this data the conclusion was drawn that a duct of 5- x 6-ft. would carry the volume of gases necessary to drive off 5 percent to 8 percent H_2O at the rate of 50 to 55 tons of rock per hour with the dryer operating at high speed. The raw dryer was located about 35 ft. from the kiln housing and is 8 ft. in diameter by



Left: Suction pipe in No. 9 fan and discharge on sweeping curve into dryer stack. Right: Suction end of fan where it enters dryer housing and discharges into 6- x 78-ft. dryer stack

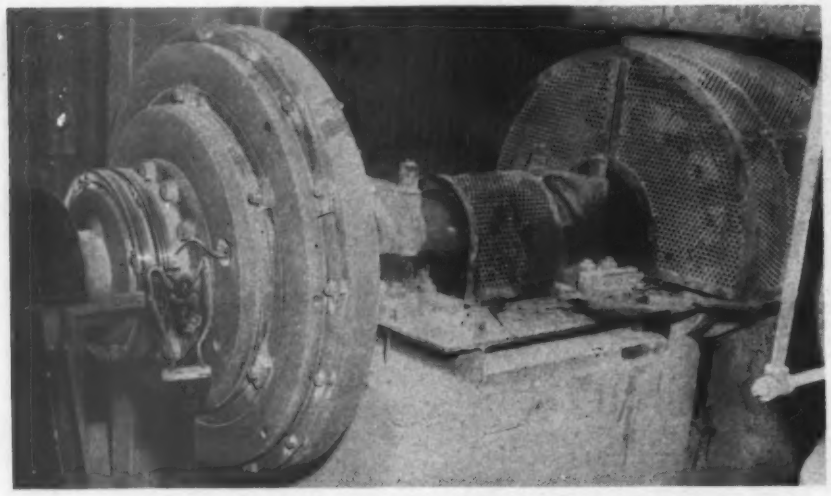
Diesel-powered 2½-cu. yd. shovel loading 15-ton haulage unit in quarry

80 ft. long, unlined but equipped with "Z" bar lifter plates. The dryer connects to its own housing with a stack 6 ft. in diameter by 78 ft. high. It was felt this stack would be the bottleneck in our system as we were shy on height to give us enough draft to draw the gases from the kiln housing 135 ft. away against a pressure of 50 tons of stone tumbling through the dryer per hour.

However, we went ahead with the construction of the duct with odds and ends of material on hand. First, an angle iron frame was made and 3/16-in. steel sheets welded to form sides and bottom. Several clean-out doors were provided and at the dryer hood a large door gave access to the dryer itself for inside repairs and replacement parts. We then proceeded to line this frame work with 4-in. fire brick on floors and sides, using a 6-in. arch brick for the top. To keep the top from spreading, take-up bars were placed every 2 ft. to 3 ft. apart. The entire inside was plastered with fire clay and cement and the arched top on the inside and outside was given a coat of plaster.

Where ducts entered the kiln housings, a channel iron frame was provided in order to install a cast iron damper, 7- x 7- x 1-ft., to withstand the heat. These dampers are raised or lowered with a one-ton electric hoist. As an added precaution, a damper was installed on top of the housing at the base of No. 5 and 6 kiln stacks. Here again we used cast iron, but had to abandon this for the higher temperature caused the 3-in. pipe and damper to warp so badly that it bound in the bearings set outside the stack to such an extent that it was impossible to move the damper. Our next attempt with the damper was more successful for we used ¼-in. heat resisting stainless steel plate and stainless steel tubing. Though we encountered some warping, this

Left: Duct in the form of Y where it enters No. 5 and No. 6 kiln housings. Old pulverized-coal pipe is still in place and could be used by going through manhole provided in top of duct. Right: Another view of duct showing side that comes from No. 6 kiln and the end of 8-ft. x 80-ft. dryer



Magnetic clutch and short drive shaft with flexible coupling geared to tube mill

damper gives us quite long service, and when it becomes too badly warped, we reverse this damper and it tends to warp back into its original position.

In August of 1943 we were ready to try out the duct and see what the results would be. While it worked to a certain degree, there was too much resistance and back pressure so that the fire and smoke came out around the hood of the kiln. This produced a very short burning zone and was not very desirable as it required too close attention on the part of the kiln burner. However, this condition was more or less expected, and it was felt from the first that a fan installed at the housing of the dryer and discharging into the dryer stack would be necessary. A No. 9 Sturtevant fan, which we calculated would handle sufficient c.f.m. of air to do the job satisfactorily, was therefore installed. The suction end was run into the dryer behind the feed spout, and the discharge end was given a sweeping curve into the dryer stack. With the installation of this fan our kiln condition improved, and we are still operating this way, except for one other change. The tapered feed end of the kiln was enlarged from 4 ft. 8 in. to 5 ft. 8 in. to increase the flow of gases. Since the entire system is under suction, there is no possibility of the gases causing the workmen any trouble.

Modernize Stock House

We were now ready to proceed with our next project, one that had been on the agenda as far back as 1924. At Reliance Mill we still have one of the old type, open-bin stock houses. This is 225 ft. long and 80 ft. wide, 12 ft. of the 80 ft. width being utilized as an area way where our kitching machines are mounted on tracks so that they can be moved from bin to bin. Also, our main screw conveyor that conveys the cement from the silos and stock house to the packing bins runs through this area way. The stock house was divided into bins of various capacities, the partition walls being made of 3-in. plank and 8- x 8-in. timbers. These walls carried the wooden roof trusses and were held together with numerous cables, rods and chains criss-crossing from end to end and side to side. In fact they looked like a giant spider web. Our object was to remove these partitions and construct reinforced concrete walls in their place, and at the same time not disturb the roof trusses. When one looked at the maze of bracing and cables, with none of the timbers plumb and thoroughly dried out and rotten, it certainly appeared to be a hopeless and hazardous job.

By November we had completed a set of 3/16-in. sheet steel forms of welded and flanged construction that would enable us to set up a section of 17 ft. at one time. The walls were to be 68 ft. long, 17 ft. high and 7 in. thick of reinforced concrete with five 22- x 26-in. columns equally spaced throughout the 68 ft. of length. We found that we could pour one of the 17 ft. sections in an eight hour working day. The next day the forms were removed and set up to form the next section; and if everything went satisfactorily, we could pour about every other day. Sometimes this was impossible as the roof trusses had to be jacked up and braced, and after the concrete wall was hard, the trusses were let down on the top of the wall. Our mixer was set up outside of the stock house, and it was necessary to wheelbarrow all the concrete for several hundred feet to the forms. Rather than build a tower to hoist our concrete to the top of the form, we utilized one of the old kitching machines and used this as a hoist. Each roof truss was knee-braced as we went along; each section of old partition was removed as required to set the forms.

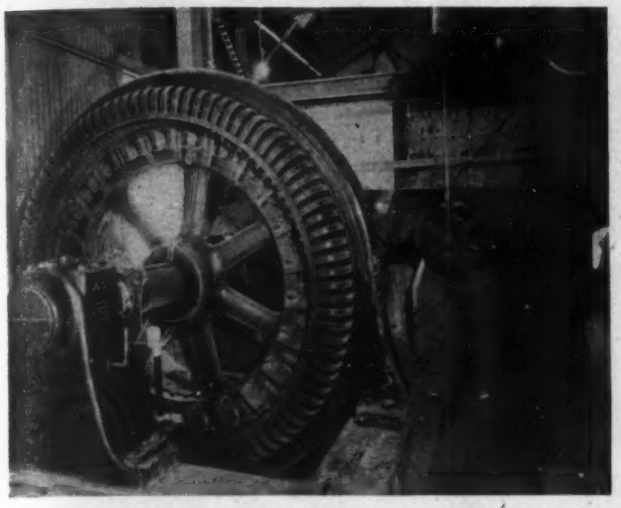
By this time we were operating the plant at 25 percent of capacity, therefore, our quarry crew worked every other week in the quarry. When they weren't doing quarry work, they were used on construction. Our clinker mill gang was used in the same manner, thus giving us a construction crew full time. Even so, the job was long drawn out and the walls were not completed until August, 1944.

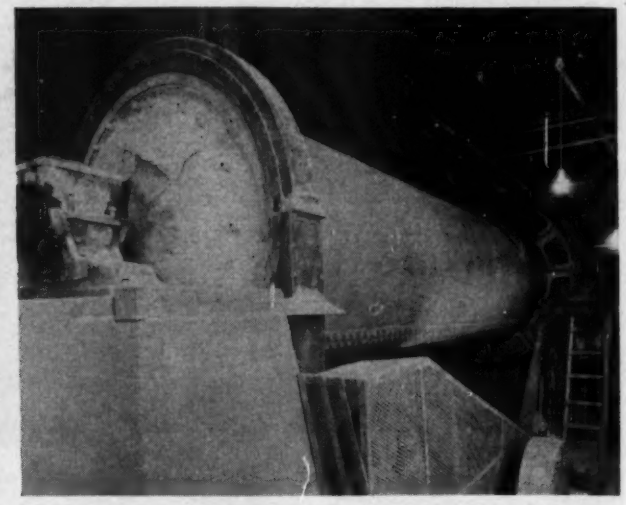
Increase Clinker Grinding Output

Next on the program was increased output in the clinker grinding department. Our finished grinding department up until this time consisted of two Bethlehem mills for preliminary grinding. The product from these two mills was conveyed by bucket elevator and screw conveyor to a large box holding 2800 bbls. of stock directly over the five tube mills. Four of the tube mills were No. 16 F. L. Smidth 5½- x 22-ft., and one No. 18, 6½- x 22-ft. Feed for the tube mills was tapped into a double deck conveyor. This double deck conveyor assured uniform feed and prevented flushing of material. The finished product from the tube mills either went to a 16-ft. Bradley air separator, or the air separator was by-passed entirely, the cement being delivered to the silos or stock house by a bucket elevator and screw conveyor.

When the old Central Mill was sold for scrap in 1942, we retained a

Showing section of old stock house with reinforced concrete walls and columns. Note how roof trusses rest on new walls





Left: Driving unit for tube mill is 200 h.p., 440-volt, 3-phase, 60-cycle motor. Double-deck conveyor and tube mill feed motor in background. Right: Installation of 5½- x 22-ft. tube mill in new building

No. 16 F. L. Smidth tube mill with the idea of adding this on the line with the other five mills. In order to install this mill we built a 13-ft. addition to the present building, and extended the double deck feed conveyor and the finished cement conveyor both by one 12-ft. length to take care of this additional mill.

We planned to use a 200-hp. Allis-Chalmers motor that had formerly run the line shaft in the old coal house which was abandoned in 1939 when direct-firing units were installed. This motor did not have enough torque to turn over and start a 20-ton mill, plus 16 tons of grinding media. It was therefore decided to get a 40-in. diameter Cutler-Hammer magnetic clutch, one-half to be mounted on the short motor shaft, and the other to a short shaft and flexible coupling which in turn connected to a pinion and gear in order to drive the mill.

Work was started on the building foundation in October, 1944. The tube mill and motor were moved into position and the conveyor sections constructed, but we were held up about four months on delivery of the magetic clutch and nearly twelve months on the General Electric starting equipment. In September, 1945, the job was completed and the mill put in operation. By this time the war was over and the demand for cement was rapidly on the increase. We were glad, indeed, to have the grinding facilities this extra tube mill gave us.

Four 4- x 10-ft. type 38 Tyler Hum-mer screens will be delivered in August of this year. It is our intention to use these screens in closed circuit with the Bethlehem mills. It is our hope that this will give us approximately 15 percent increase in our finished cement output. When this installation is completed we should be able to grind in 16 hours of finishing mill operation the approximate output of the kilns on a 24-hour basis. Since we purchase power, all of our grinding, by necessity, must be made on the 16 hours of off-peak power.

Step Up Quarry Capacity

Before the war started we knew that we would have to purchase new

Haulage unit dumping stone to grizzly feeder for primary crusher

equipment for our quarry. However, all of this was delayed due to the impossibility of purchasing this type of equipment after the war started. In the early spring of 1945 all signs pointed to an early end to the European war, and it was now time to give serious thought to our quarry problem. We had been operating two 2½-cu. yd. steam shovels of the Panama Canal vintage. While the shovels were rebuilt in the early 20's, they were now completely worn out. Our stone was hauled from the quarry in 10-ton side-dump quarry cars by four steam locomotives, two of 20-ton capacity and two of 25-ton capacity. Needless to say, after 25 years of service these locomotives were ready to scrap.

During the last 10 years in modernizing cement quarries, the trend has been toward the trucking of stone. We made several inspection trips to see trucks of various makes and types in operation. One very impressive trip was to the Cooley Brothers iron ore mine at Hibbing, Minn. There was also plenty of opportunity to see trucks in operation on the big coal stripping jobs in the anthracite coal district within 50 miles of our plant. Our final choice was the Euclid Model 27-FD 15-ton, end-dump Diesel job equipped with power steering. On our inspection trips we also had an opportunity to observe a number of various makes of shovels in operation. After all things considered, our choice was a Northwest Model 80-D with Murphy Diesel engine. The 80-D is equipped with a 2½-cu. yd. shovel, and from our observations, this was a very fast machine.

Orders for three trucks and a shovel were placed the day after the V-J day holiday. Delivery of the trucks was made in the last week of December, 1945, and the shovel arrived the last week of January, 1946. This new equipment was placed into operation immediately. February being a short month, the tonnage of rock was correspondingly less than an average month. Even so, on a per ton basis we were able to reduce the cost of stone delivered from quarry to crusher by about 40 percent over our previous year's average. One month of operation was hardly a fair trial, but March, April and May were equally as good, so we have reasons to believe this will continue. With the installation of the new equipment we have been able to reduce considerably the amount of labor in quarry.

One thing that might be mentioned at this time, which we feel has

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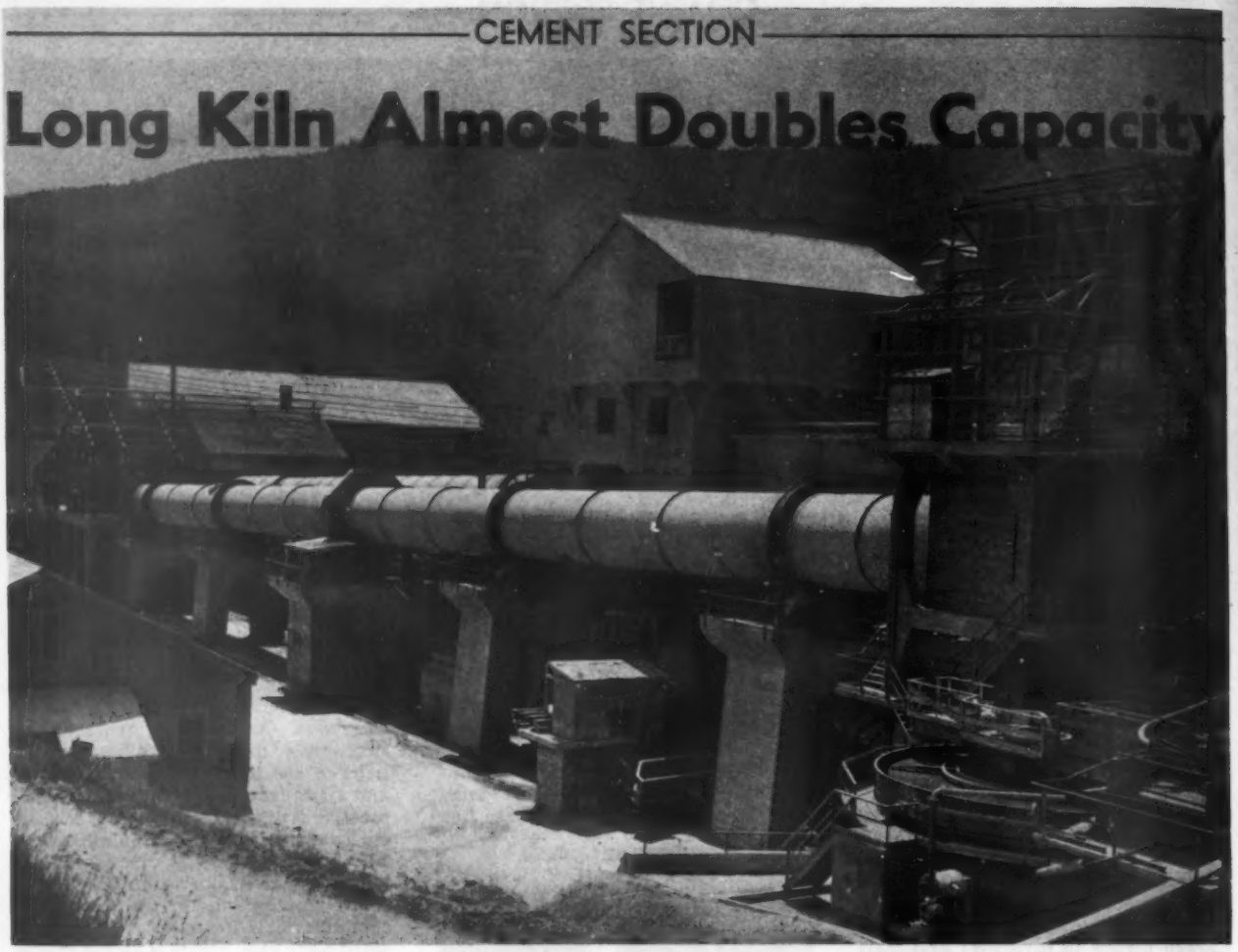
Long Kiln Almost Doubles Capacity



Overall view of cement plant, showing the new third kiln in foreground

Calaveras Cement Co. will enlarge raw and finish grinding departments to accommodate 360-ft. kiln recently added; has close regulation over stack dust feed to kiln

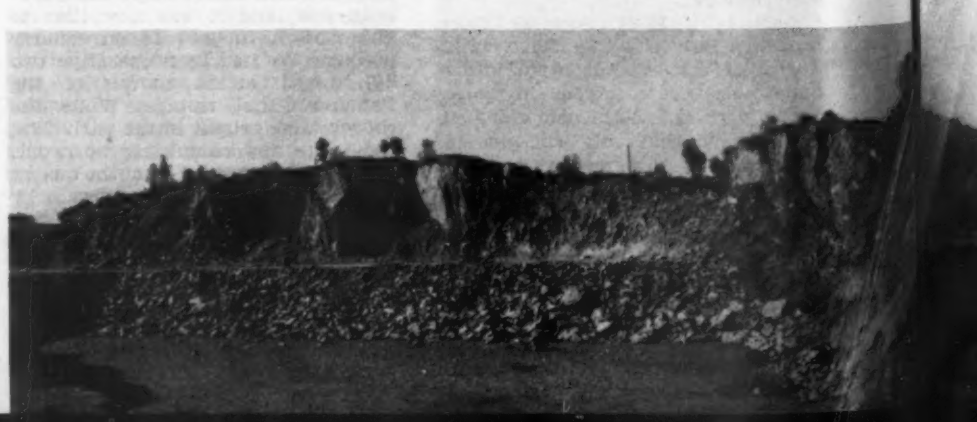
CALAVERAS CEMENT CO., San Francisco, Calif., has completed installation of a third kiln at its Kentucky House wet process plant near San Andreas, Calif., located in the heart of the Mother Lode, famous for the vast fortunes of gold taken from its hills by the miners of '49. With installation of the new kiln, output has been increased to 2,225,000 bbl. annually. Since the plant was built in 1926 the company has followed a program of constant modernization and steady growth to the present capacity.

Early in 1945 the 11-ft. 3-in. by 360-ft. Allis-Chalmers kiln used by Manganese Ore Co. at Henderson, Nevada, was declared surplus by the Defense Plant Corp., and purchased by Calaveras Cement Co. Dismantling and shipping the kiln and its accessories required several months. The kiln was cut into nine sections for shipment, and specially routed by the railroads, since the sections were both excess width and excess length. Erection at Kentucky House required several more months, and finally, after some preliminary trial runs, it was formally dedicated at a barbecue at the plant, with more than 700 guests present.

Of modern, welded construction throughout, the new kiln exemplifies the growing trend in cement manufacture to burn in longer, larger-diameter kilns. When the raw- and finish-grinding departments have been enlarged to conform with the increased burning capacity, the new kiln is expected to add more than 3500 bbl. of cement to Calaveras' daily output.

The new kiln has been erected parallel to the old 240-ft. kilns, with the burning end even with an extension of the old burning floor. The feed end thus extends 120 ft. beyond the old kilns, and the exit gases are brought back from the dust chamber so that the dust discharges into the same Cottrell that serves the 240-ft. kilns.

The kiln is supported on five arch-type concrete piers, has a 7/16-in. to the foot slope, and turns on trunnions running in water-cooled bronze bearings. It is powered by a 150-hp. variable-speed induction motor, which drives an Allis-Chalmers generator



Right: Quarry at No. 1 Hill located about one-half mile from plant

Wm. Wallace Main, president and founder of the company

connected to the motor shaft. The generator is electrically-connected with the ferris wheel slurry feeder and dust-return motors, so that the rate of slurry fed to the kiln, and of dust returned, is exactly proportional to the speed of rotation of the kiln. This insures a uniform load in the kiln if the burner finds it necessary to alter the speed of rotation. This method of feed control is a development of Allis-Chalmers Co. and is known as a "Synchronous Tie."

Feeding Dust into Kilns

The method of returning Cottrell stack dust to the kiln is believed to be novel at this plant. From the Cottrell dust-screws it is pumped by Fuller-Kinyon system to a bin above the feed floor. From this bin the dust is withdrawn by a screw in synchronous tie with the kiln speed, and thence discharged into a pug-mill, where it joins the slurry feed from the ferris wheel. The slurry and dust are beaten together just before the mixture is fed to the kiln. This has been found a very satisfactory method of returning dust, and is the final method developed by trial and error from several other systems of dust return. Its advantages are that the mixing is adequate to prevent separation in the kiln, and the dust, which has hydraulic properties, is kept out of the circulating slurry system. The dust and slurry can be so proportioned as to give a correct mix as fed to the kiln, and the uniform rate of feed prevents the dust, which is much higher in lime than the slurry, from throwing the feed "off-mix" and thus interfering with uniform burning.

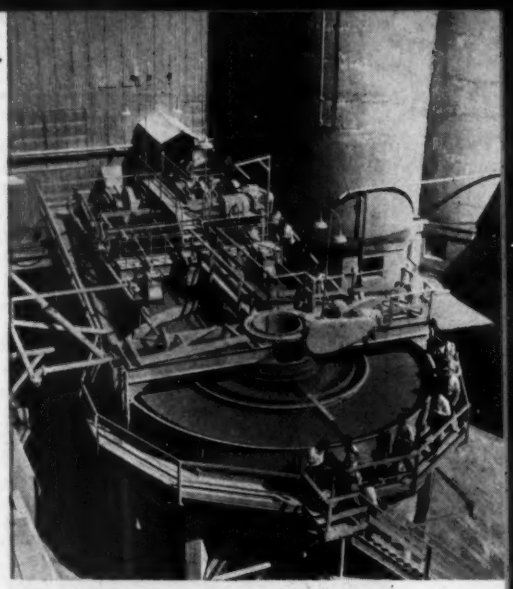
Chains—Clinker Cooler

The kiln is equipped with chains to increase the heat transfer in the drying zone. The exit gases are exhausted by a Sturtevant 11-ft. steel-plate, double-inlet fan, with a capacity of 180,000 c.f.m. at 4 in. and 600 deg., driven by a 200-hp., .80 power factor synchronous motor.

Clinker is discharged into a 6- x 33-ft. Fuller inclined-grate cooler with automatic bed-speed control, which is actuated, through a chromel-alumel thermo-couple, by radiant heat from the clinker bed. When operated within its capacity range it maintains an approximately constant thickness and temperature of clinker bed, with uniform resistance to the flow of cooling air through it. A uniform temperature of secondary air for combustion is thus assured, which eliminates a variable that is troublesome in many burning operations.

Firing

The usual fuel is natural gas, which is controlled by a Foxboro Stabilog recording gas controller. The burner is a special design which is equipped to mix up to 50 percent primary air with the gas. The amount of primary air is regulated by a Foxboro automatic recording ratio controller.



Visitors being conducted through plant are inspecting classifier

When set for any proportion of primary air to gas it maintains that same proportion with any gas setting. If the burner finds it necessary to alter the gas, the proportion of primary air follows automatically, so that even though the amount of heat liberated in the burning zone will be changed, the character of the flame will not.

Louvres at the Sturtevant exhaust fan are actuated by a Bailey automatic control, which maintains a constant hood draft. This can be changed to manual control if desired. A duplex Hayes gauge indicates to the burner the hood and dust chamber draft, and these drafts are at the same time recorded on two Bailey recording meters, so that the comparative drafts at any time are a matter of record. The hood draft controls the amount of secondary air, and therefore the type of combustion, and a comparison of the hood draft and the dust-chamber draft is a measure of the internal condition of the kiln. Under normal operation

Bulk cement haulage equipment with a capacity of 130 bbl.

Left: Diesel trucks unloading at the primary crusher. New type truck and trailer combination hauls 35 tons per trip

Wm. Wallace Mein, Jr., vice-president

J. B. Smith, treasurer

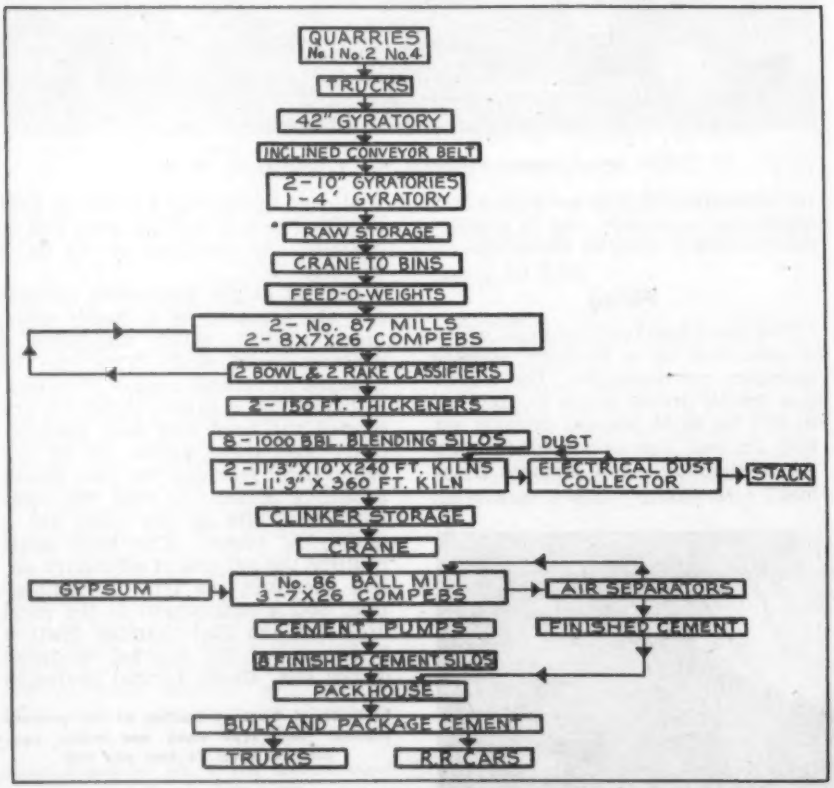
H. C. Magnn, vice-president and chairman of the operating committee

the hood draft is zero, or minus one or two hundredths of an inch. With a clear kiln, a dust-chamber draft of a little over an inch will maintain this. Any increase in dust-chamber draft much over an inch indicates rings or other obstructions in the kiln. Recording pyrometers on the burning floor give the burning-zone, exit gas, and fan temperatures.

Operation of the new kiln has increased the burning capacity of the plant above that of the raw or finish grinding departments, and additional equipment is now on order, or is being erected. This will bring the raw grinding and finish grinding capacity above that of the kilns, and raise the plant capacity to about 7500 bbl. of finished cement per day.

This new equipment includes a 200-ton surge bin at the head of the inclined conveyor belt between the 42-in. McCully primary gyratory and the secondary crushers. Before flowing into the surge bin, the rock will go through a trommel washer with 1¼-in. holes. The undersize will go to a dewatering tank and thence to raw storage; the reclaimed water, with bleed-off to the bowl classifiers will go back to the washer. The object of this is not only to remove fines from the bin, so that the rock will flow freely into the secondary crushers, but also to remove clay and mud which, sometimes in winter, pancake in the secondary crushers.

The secondary crusher capacity has been increased by adding to the two 10-in. gyratories a 48-in. Telsmith crusher, which reduces in one pass from 5 in. to ¾ in. A reciprocating feeder will remove rock from the surge bin and assure an even flow of feed to the crusher. The crusher is now in operation, but slow shipments on some of the feeder parts have delayed its completion.



Flow sheet of cement manufacturing operations

Raw Mill

Due to the Dorr system the raw grinding capacity has been increased substantially. The sands from two bob-tailed rake classifiers are returned to the first compartment of the raw mills, the overflow going to bowl classifiers in closed circuit with the second compartments. The bowl overflow goes to the two 150-ft. Dorr thickeners, where the moisture is reduced to an average of 35 percent before feeding the slurry to the kilns.

Clinker Grinding

The finish grinding capacity is being increased by a Marcy mill now being erected. This mill will be used as a preliminator; that is, it will be loaded with large balls and all clinker will pass through it and be ground to approximately 20-mesh. This

ground clinker will be distributed to the 7- x 26-ft. Allis-Chalmers Compeb mills in closed-circuit with Sturtevant 10-ft., 14-ft. and 16-ft. air separators. The small size of clinker feed to these mills will enable the use of smaller balls with greater surface area, thus increasing the grinding efficiency and output much above that now obtainable by feeding clinker directly to the first compartment, loaded with large balls. The separator and mill hook-up is so designed that the various products can be split and distributed in any way desired, thus enabling the most efficient method to be used for grinding the many types of special cements that the market now demands.

Quarrying

Rock for manufacturing the different cements is obtained from the limestone quarries and from special shale quarries when low-alkali, low-heat, sulphate-resisting or other highly specialized types of cement are required. Haulage of rock to the primary gyratory is by company trucks over private roads. The trucks include the most modern equipment obtainable, the latest additions to the fleet being two Diesel side-dump, semi-trailers, each with two dump-bodies and a total capacity of 35 tons. The longest haul is 5½ miles from No. 4 quarry. Ample limestone and shale reserves are blocked out to enable the company to produce far into the future any special cements desired. The Mother Lode belt of California contains highly metamorphosed rocks of great variety, and, no matter how many special cements the market of the future may demand, the company is in a position to supply any of them. Limestone and special shales are blocked out by hand-sampling, churn-drilling and diamond-drilling. The data obtained are plotted on maps and the staff is thus enabled to mine any desired quality of rock on short notice.

Drilling for blasting is done by 6-in. and 9-in. churn drills, the holes being chambered and then blasted simultaneously by detonating fuse. As much as 500,000 tons has been broken at one blast. Some of the rock breaks too large for the primary crusher, and secondary blasting, or block-holing, is thus a routine part of the quarry operations. Rock is loaded by a 75-B Bucyrus-Erie electric shovel. A Bucyrus-Erie 120-B is now on order to handle the company's increased rock requirements.

The accompanying flow sheet shows the general outline of the enlarged plant.

Types of Cement

Cements manufactured include ASTM Types I, II, III, IV, V; Low-alkali; Plastic; and Calaveras White. The latter is a white portland cement of exceptional purity and is the only white cement manufactured on the Pacific Coast. The other cements exceed all federal, state and highway, as well as ASTM specifications. Not all the cements are carried in stock at all times, as some of the highly specialized types, such as low-heat (Type IV)-Low-alkali are normally only for large projects such as dams and are manufactured only on orders for large quantities.

Modernizing Plant and Quarry

(Continued from page 111)

been a good move, was our decision to put two operators of equal status on the shovel. Our reasoning for this was as follows: At all times we have a spare operator so that during the day they can change off with one another. While one man is operating the shovel, the other goes over the oiling and greasing and also acts as a pit man and keeps all loose stone picked up around where the trucks back in. He is also in a position to guide the trucks to their loading spot, which is an important factor from a safety angle. We feel this has worked out to the advantage of the operators as well as to the company.

No special roadway was built for the trucks. However, we do endeavor to keep the route clear of falling stone as this is very important insofar as tire wear and upkeep for repairs is concerned. Very little change at the crusher was necessary to dump the trucks. A space of about 100 ft. square outside the crusher building was dug out to a depth of 15 to 18 in. and filled in with crushed cement rock, thus giving up a good foundation and road bed to turn the trucks on.

It is necessary for the trucks to make a turn and back into the crusher building where we have a dumping block to warn the driver when he is in position to hoist his truck. The stone is dumped on a 5- x 12-ft. Traylor grizzly bar feeder which discharges into a 48- x 60-in. Traylor jaw crusher. Our secondary crushing is done by a 42- x 48-in. Jeffrey hammer mill and from there goes by Peck carrier to the stone storage silos.

To give some idea as to what can be done with the shovel and trucks in one day of 7¾ hours, we loaded and hauled to the crusher 1668 tons of stone. I have clocked the operator of the shovel at various times, and he has loaded 15 tons into the truck in less than 2½ min. At present our haul is between 600 ft. and 700 ft. one way to the crusher. The time required for the trucks to load, make the trip, unload, and make the trip back again, is from 10 to 12 minutes. Our average tonnage per day has been around 1200 tons of stone.

Drilling and Blasting

At present we are working a quarry face of about 80 ft. in height by about 400 ft. in length. Drilling is done by a Loomis wagon drill; holes of 6-in. diameter are put down in a spacing of 16 ft. to 20 ft. We usually blast in the neighborhood of 60,000 to 75,000 tons at one time. This represents about 23 to 26 holes. With truck and shovel operation we have a very flexible system. Within one hour after a blast we can be hauling stone, whereas with the old system it was necessary to cast the stone back before laying track. This oftentimes required as much as two days before we were able to load stone and send it to the crusher.

Four months of operation is hardly long enough to judge or quote figures as they could be misleading. However, we are thoroughly satisfied we have made a wise move on the purchase of this equipment. In fact we have now on order another 1½-cu. yd. Northwest shovel with auxiliary 60-ft. boom for dragline or crane. One more Euclid truck is expected to be delivered in July or August. We have also placed an order for a Caterpillar D-4 bulldozer with angle blade to be used in keeping the roadway in good shape, and to clean up loose stone around the shovel.

Two improvement projects remain on the calendar. One is to rebuild our present packing house and install new packing machines, and provide more space for storage of paper bags and foreign cements. The remaining project is to convert the present coal unloading system from drag chain, bucket elevator, and screw conveyor to a belt handling system, thus eliminating a lot of headaches on the handling of wet coal.

We feel that we were fortunate to be able to accomplish these improvements with our small force of men during the war period, and by so doing, place ourselves in better position to take advantage of the anticipated good business all the cement companies expect to enjoy during the next few years.

To Make Concrete Brick

The Brikcrete Products Co., Moline, Ill., has purchased equipment from Brikcrete Associates, Inc., Grand Rapids, Mich., and expect delivery about September, 1946. Capacity will be 4000 units per day which will be equivalent to 12,000 clay brick as each unit will lay as much wall as four standard clay brick. E. M. Gould is manager of the new plant being erected on First avenue, between 54th and 55th streets.

Kiln room in one of the most modern eastern cement plants

MYSTERIES of Rotary Kiln Performance

By NATHAN C. ROCKWOOD

EVER SINCE the rotary kiln came into general use in the portland cement and lime industries various investigators have been trying to solve some of the mysteries involved in its actual performance. These mysteries or problems have been studied from many angles, but probably more attention has been paid to problems of extracting maximum heat efficiency than other phases of the general problem, such as the function of kilns as instruments or implements of chemical reactions.

Only comparatively recently have we known much of anything about the mode of chemical reactions between solid particles, and even now such knowledge as we have is more theoretical than based on data gathered from practical experience in commercial operation of kilns. Yet, the kiln is the very heart of the portland cement manufacturing process, and without adequate knowledge of its functioning, many problems will remain unsolved. As a simple illustration, apparently no one knows what the ideal dimensions of a rotary kiln should be. The kilns we have are the products of constant experiment, generally in the direction of longer kilns, and of various devices for heat recovery and utilization.

That long kilns—say 400 ft. and over—make more clinker at better fuel ratios is now well established, but *why* two 200-ft. kilns, joined together to make one 400-ft. kiln of the same diameter as before, should produce at least 50 percent more clinker than a 200-ft. kiln is not known. It has always been assumed that diameter was a far more important factor in kiln capacity than length, for the load a kiln can carry is obviously proportional to the square of the inside diameter. The doubling of the length of a kiln must therefore increase its efficiency as a chemical-processing device as well as its efficiency in heat utilization.

Chemical Processing

The theoretical chemical processing that is designed to take place in a rotary kiln has undergone some change of opinion since rotary kilns were introduced for the manufacture of portland cement. The industry started in this country something over a half century ago with the theories and practical experience gained from the manufacture of hydraulic limes and natural cements in vertical or shaft kilns. Some of these natural cement raw materials were very nearly of the proportions of limestone and argillaceous materials that portland cement raw materials now have. They made good cements although not ground anywhere nearly as fine as later portland cements—that is they were good in the sense that they resulted in good and lasting concretes and mortars. In making these natural cements, *fusion* or over-burning, was purposely avoided, although one reason appears to have been to avoid grinding difficulties.

Any philosophic researcher in cement will find much interesting and suggestive material in Gillmore's "Practical Treatise on Limes, Hydraulic Cements and Mortars," published in the 1870's when imported portland cements were just being introduced in the United States. One thing of interest to the present discussion is the comparison of various American natural cements, and the variety of results obtained by burning natural cement rocks for different periods of time. Since chemical analyses are given of some of these rocks, probably the present-day cement chemist could readily account for some of the things that greatly mystified General Gillmore. The only point we wish to make here is that some of the various rocks, or natural mixtures of cement raw materials, were very sensitive to the length of time of calcination.

The correct burning process was so vital a factor that progressive cement manufacturers always had one or more "try kilns," which were small experimental or pilot kilns where the particular stone was experimented with for best results. Some stones required much less burning than others, and in no case were they burned beyond the point of "incipient fusion." To do so, in the opinion of these early experimenters, would have ruined the product. There is no other conclusion to be drawn from this early practice than that good hydraulic cements can be manufactured without actual vitrification or fusing of the raw materials.

It is true, of course, that these natural cements had several disadvantages, such as uncontrolable time of set, slow gain in strength and lack of uniformity. Were they made today, the time of set could be controlled with gypsum, as are portland cements, and some of their other irregularities might be controlled by finer grinding and blending. They went out of use, not so much because early portland cements made in rotary kilns were so superior in making good "permanent" concrete, as because the manufacture of natural cements required eternal vigilance in selection of the kiln rock, even from the same quarry, since stone from the different ledges required different periods of calcination. Therefore, it would appear that heat-promoted chemical combinations in a cement kiln are not necessarily the simple reactions they are generally assumed to be.

Effect of Time of Calcination

Gillmore gives some interesting data on the effect of time of calcination on various natural cement rocks. Below is shown an adaptation of one of his graphs, in which we have selected only three typical rocks. No. 1 has about the same analysis as portland cement raw mix except that it is very low in alumina and iron oxide. By present-day methods this combination would be practically impossible to burn according to modern rotary kiln practice. This is shown by the fact that it was almost impossible to "overburn" it in a shaft kiln. It gave the best cement as measured by its ability to set under water (hydraulic energy). The center line (0-0) on the chart represents the points at which the cement pastes ceased to have any ability to set under water and actually started to disintegrate. The effects of magnesium carbonate are shown in Nos. 2 and 3, the former rock having 35.6 percent, and the latter 22.6 percent. It will be noted that the high magnesia cement had very fair hydraulic properties if burned for less than one hour, but lost these properties rapidly after that. This meant, probably, that at this stage the magnesia was active. With the lime-magnesia ratio better than 2 to 1 (No. 3), the hydraulic properties of the cement were retained fairly constant for from one to three hours' burning, but lost them altogether at six hours' burning.

Many of these high magnesia cements, properly burned, gave excellent results. The reason evidently was that pains were taken not to hard-burn the magnesia. The lime (CaO) doubtless was under-burned; but, according to Gillmore, the underburned lime, itself, had hydraulic properties. In recent years, of course, magnesia has been very much taboo in portland cements; but portland cements are hard burned, and the natural cements containing magnesia were not. If present-day portland cement manufacturers would do as their predecessors did, and make "try kilns" a regular part of their operations, they might be able to develop a modern high magnesia cement that would be as good as (and possibly better than, in some respects) portland cement, since magnesia compounds are less soluble than those of lime.

Any Size Kiln Will Make Cement

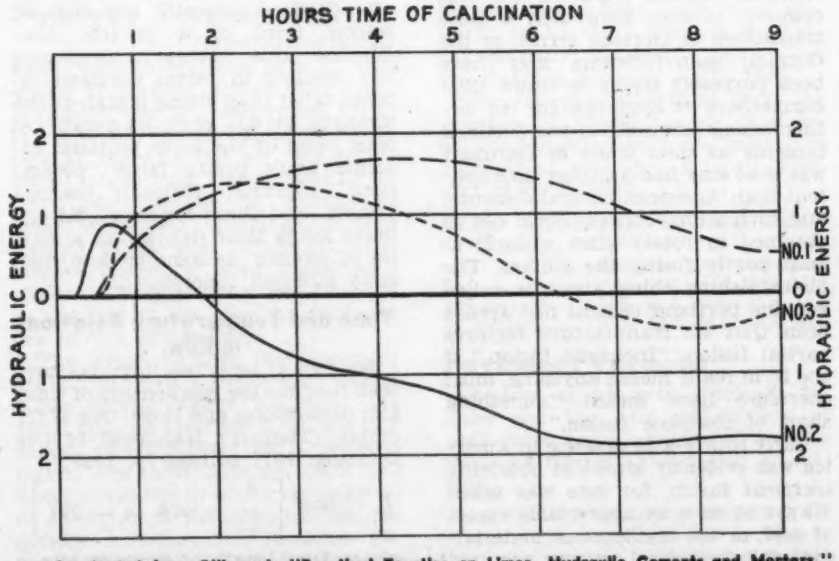
One of the mysteries of the rotary kiln is that it will produce portland cement clinker if only 6 ft. long, provided its diameter and slope are in proportion. Laboratory kilns are made as small as that although probably one 12 ft. long is more practical. It is really remarkable that every modern plant laboratory is not equipped with such an experimental or pilot kiln. In the few instances that we know of where manufacturers have used such pilot kilns, they have learned a lot about their materials without experimenting on a commercial scale. It is true, of course, that it is easier and cheaper for the plant chemist to make his experimental clinkers in crucibles in an electric or gas-fired furnace; but after all, one of the things to be studied is the rotary kiln itself.

Since, then, a ½- x 6-ft. kiln and a 12- x 500-ft. kiln will both produce a satisfactory portland cement clinker, what are the factors that influence the necessary chemical reactions other than the application of heat at approximately 2900 deg. F. temperature for perhaps 1 to 3 hours?

It is common knowledge that a cement kiln performs at least four functions of chemical processing: (1) drives off free water or moisture; (2) preheats the raw materials and drives off the water of crystallization, which has some chemical effect on the alumina, iron and silica; (3) calcines the limestone; (4) combines the lime set free with compounds of the alumina, iron and silica; that is, combines all into clinkers which are at least partly vitrified slags.

Kilns are discussed in literature as divided into these four zones, or in the case of pre-dryed raw materials into three zones. Yet every investigator has shown that it is impossible to set any definite limits to these zones, with the possible exception of the clinkering zone, for all the evidence is that the actual clinkering or fusing takes place very rapidly in the hottest, relatively very short zone. All the other functions of a rotary kiln in cement manufacture require relatively long periods of time.

Breerwood, in his article on cement manufacture in the latest edition of Taggart's "Handbook of Mineral Dressing" (John Wiley & Sons, 1945) defines the functions of the four zones a little differently: (1) evaporation of uncombined water; (2) dehydration of clay and calcination of $MgCO_3$; (3) calcination of $CaCO_3$; (4) reaction between the solid oxides. This follows in general the description given by Lea and Desch in their book "The Chemistry of Cement and Concrete" (Longmans Green & Co., 1935), where the various chemical reactions assumed to take place at certain temperatures are described in



Graph adapted from Gillmore's "Practical Treatise on Limes, Hydraulic Cements and Mortars." Fig. 28: Analyses of natural cement rocks; No. 1, Round Top quarry near Hancock, Me., $CaCO_3$, 65 percent, silica 27.1 percent, $MgCO_3$, 5.3 percent, $Fe_2O_3+Al_2O_3$, 1.5 percent; No. 2, High Falls, Ulster County, N. Y., $CaCO_3$, 37.50 percent, $MgCO_3$, 35.62 percent, SiO_2 (silicates), 18.46 percent, Al_2O_3, 4.22 percent, Fe_2O_3, 2.32 percent; No. 3, Point-aux-Roches, Lake Champlain, $CaCO_3$, 53.3 percent, $MgCO_3$, 22.6 percent, SiO_2, 20.7 percent, $Al_2O_3+Fe_2O_3$, 1.7 percent

detail. Alumina and silica, they say, combines with lime at 1000 deg. C. (about 1850 deg. F.) to form monocalcium aluminate and silicate. No tricalcium silicate is formed until a temperature of 1300 deg. C. (a little less than 2400 deg. F.) is reached. The assumption that the kiln reduces all the reacting minerals to oxides, is also in disagreement with early experimenters and investigators, who believed that reaction between the lime and silicates began at temperatures actually below the calcining temperature for pure limestone when burned alone—in other words higher up in the kiln than the accepted $CaCO_3$ calcining zone. Early experience in the manufacture of natural cements and hydraulic limes tends to confirm the proposition that such combinations can and do take place at much lower than present clinkering temperatures, but, at the expense of time: We do not know the temperatures obtained in old-time shaft or rotary kilns, but shaft-kiln practice was based on previous experience in lime burning and certainly no where nearly approached the temperatures reached in modern rotary kilns burning portland cement clinker. The application of the heat, however, was generally much longer, unless the rock was high in magnesium carbonate.

What Was Meant by "Incipient Fusion"?

A few years ago the American Society for Testing Materials dropped its long held definition of portland cement as the product of "incipient fusion" of the raw materials. The origin of this definition seems to have been German and came with the early German cements imported into this country. It may have been a loose translation of German terms, or the German manufacturers may have been purposely trying to throw their competitors off the track, for the distinguishing thing about the portland cements as then made in Germany was that they had a higher lime content than American natural cements; and such a lime content could not be obtained in rotary kilns without at least partly fusing the clinker. The distinguishing thing about so-called genuine portland cement has always been that its manufacture requires partial fusion. "Incipient fusion," if the term really meant anything, must therefore have meant "something short of complete fusion."

Early rotary-kiln practice in America was evidently aimed at obtaining incipient fusion, for care was taken always to have an appreciable excess of acid, or the argillaceous, materials over the theoretical amount required for the supposed "lime saturated" clinker compounds. At that time the tricalcium silicate did not figure so prominently in the estimates of the amount of lime required, although its existence was generally accepted. It was not until later when much stress began to be put on quick-hardening and high early strength of concrete, that manufacturers began to increase the lime content of the raw mix. It then became generally known that the extra lime could be combined, or assimilated by the clinker compounds, only by actual fusion.

That is what was meant when we started out by stating that both theory and practice in the use of rotary kilns for the manufacture of portland cement has changed since rotary kilns came into general use in the industry. Now, instead of burning the clinker to incipient fusion, or slight fusion, the practice and theory seems to be to fuse it, at least, to the extent of 25 to 30 percent. That is the percentage of liquid or fused material estimated from eutectic equations of the usual component minerals. There is no proof that much more if not all of the material in a modern rotary cement kiln does not pass through a liquid stage. The conditions of forming the liquid stage are such that all the material is not acted upon at the same time. That more of the product does not come out as a glass or slag is because after fusion the temperature falls rapidly and the clinker has time after passing through the liquid stage to recrystallize, except for a relatively small amount of slag or glass, which "freezes" as such.

Thus, it is not entirely correct to say that portland cement clinker is made by the *same process* it was in the early days, or that a rotary kiln performs the same function it always did. With the introduction of high-limed cements, the process has actually changed radically, although we seldom think of it in this light. Whether this change in processing has resulted in better portland cement, other than giving it high-early-strength, is still open to debate. At least some of the early portland cements made pretty fairly "permanent" concrete, although coarsely ground, and these concretes did not begin losing their strength in a matter of months, as some modern high early strength concretes do.

Time and Temperature Relations in Kiln

We find at least two formulas have been used for the relationship of time, kiln dimensions, and slope. One is for dryers (Taggart's Handbook of Ore Dressing, 1917 edition) p. 1029:

$$L = tnsd\left[\frac{d}{2} + \text{sine } (\alpha - 90)\right]$$

where L = length of dryer or kiln
t = time of drying or calcining in minutes
n = r.p.m. of kiln or dryer
s = slope in ft. per ft.
d = inside diameter
α = average angle, reckoned in the direction of rotation from the bottom of the shell to the point where the material starts to flow downward.

This formula reconstructed to determine the time element would be:

$$t = \frac{L}{nsd\left[\frac{d}{2} + \text{sine } (\alpha - 90)\right]}$$

If we assume the same internal conditions and the same diameter and slope, and compare a 200-ft. kiln with a 400-ft. kiln, it is apparent that the time element is twice as long in the 400-ft. kiln as in the 200-ft. one. Assuming common practice: n = 1 r.p.m.; s = ½ in. per ft., or 1/24 ft. per ft.; d = 10 ft. (inside lining); α = 90 deg. ($\alpha - 90 = 0$); we would have:

$$t = \frac{L}{nsd\left[\frac{d}{2}\right]}$$

which in the case of a 200-ft. kiln figures out:

$$t = \frac{200}{1 \times 1/24 \times 10 \times 5}$$

= 96 min. or 1 hr. 36 min.

The other formula, which is now generally used, is that developed at the U. S. Bureau of Mines in T. P. 384, in 1927. It is:

$$t = \frac{1.77 \times \sqrt{\theta} \times L}{S \times D \times N} \times \text{Factor}$$

t = time of material in the kiln in minutes
L = length of kiln in feet
D = diameter of kiln inside the lining
S = slope in degrees
N = r.p.m. of kiln
θ = angle of repose of the dry materials in degrees

For a slope of ½ in. per ft., S = 2.385 deg.; and the angle θ, corresponding to the quadrant point in the previous formula, equals 45 deg. The Factor noted is to take care of obstructions or constrictions in the interior of the kiln, and for a kiln of uniform inside diameter and no ring formations, or other obstructions, would be 1.

Assuming this most favorable condition, again would show that the time element varies directly as the length of kiln, and for a 200-ft. kiln would be:

$$t = \frac{1.77 \times 6.708 \times 200}{2.385 \times 10 \times 1}$$

= 95 min., or 1 hr. 35 min.

This result not only agrees with the previous one, but is said to agree with experiments on modern rotary cement kilns, where markers have been sent through the kiln. One hour

and a half is a shorter time in the kiln in which to make clinker than Lea and Desch estimated (2½ hrs.) for a 200-ft. kiln. It is obvious that the time element has never been considered as of vital importance, or the same slope would not have been adopted for nearly all lengths of kilns. Apparently it is not important so far as being able to make satisfactory clinker is concerned for a 100-ft. kiln, 8-ft. inside the lining, ½ in. to 1 ft. slope, 1 r.p.m., the time would be only about 62 min., or a little over an hour. The reduction in diameter partly compensates for the shorter kiln, so far as the time factor alone is concerned.

Peripheral Speed

It would seem that the peripheral speed of the inside surface of the kiln would be a more important factor than any other, if it is desirable for the material to advance in a kiln at any given rate. Only at some uniform peripheral speed could actual conditions be compared in different lengths of kilns, if slope and other conditions remained constant. A 10-ft. diameter (inside lining) kiln revolving at 1 r.p.m. would have an inside peripheral speed of 31.42 f.p.m. A 9-ft. inside diameter kiln would have a peripheral speed of 28.27 f.p.m.; and 25.13 f.p.m. would be the speed of an 8-ft. inside diameter kiln; 21.99 f.p.m. for a 7-ft. diameter. According to various plant descriptions, as published in ROCK PRODUCTS, we find that the practice has been to rotate kilns at speeds varying from 1/5 r.p.m. to 1⅗ r.p.m. The 1/5 r.p.m. (1 revolution in 5 min.) was for a kiln 11- x 175-ft., ½ in. per ft. slope. Assuming an inside diameter of 10 ft., the inside peripheral speed would be only 6.28 f.p.m. The 1⅗ r.p.m. was for a kiln 10- x 300-ft., and would give an inside peripheral speed of 47.12 f.p.m. Obviously a tremendous range in peripheral speeds is practiced, which shows apparent lack of any scientific determination of the proper speed.

Discussion to Be Continued

Having reached the economic limit for a single article, we will have to postpone further discussion of the chemical functions of a rotary kiln in cement processing for a later issue. It is not our purpose, nor is it in the range of our ability, to contribute anything new to this discussion. Our chief purpose is to review the literature for items that possibly have been forgotten or overlooked, or to present them again in a different or original way as food for thought and possible investigation. We are indebted to several friends in the industry for ideas, suggestions and criticisms; and we will welcome discussions from any interested reader. There are many data and ideas yet to be presented.

Marquette's Long Kiln

(Continued from page 103)

stone is quarried on a 20-ft. ledge on contract as described in the article in the October, 1941, issue. Its analysis is, 13.96 silica, 3.27 alumina, 1.27 iron, 43.51 lime, 2.42 magnesia, ignition loss 36.17, taken of a typical sample. A high silica shale underlying the limestone is also excavated.

The crushing plant consists, principally, of a No. 18 McCully gyratory crusher and a Gruendler XXB hammer mill, of recent installation, with a minus ¾-in. product delivered at the rate of 250 t.p.h. over belt conveyor via a Link-Belt travelling tripper into the raw material storage building.

Finish Grinding

Clinker is ground through a preliminary closed-circuit, with three No. 85 kominuters and eight Tyler Hum-mers carrying 20-mesh cloth. Rejects are put through a fourth kominuter and the final grind is through three No. 20 Smidth tube mills in open circuit. Darex air-entraining agent is added in the tube mills. Cement is stocked in silos of 150,000 bbl. total capacity. No changes were made in the finish end at the time the plant was rebuilt.

A. F. Miller, chief engineer of Marquette's efigineering staff collaborated in the design of the plant with R. Moyle, Sr., vice-president in charge of operations, and Frank Moyle, general superintendent, in development of the layout, arrangement of equipment and the process. J. C. Bennett is superintendent of the Hawkeye plant and J. V. Mandia is chief chemist.

Two-way Purpose Belt

(Continued from page 89)

weigh batcher equipped with 5-beam scales. To prevent cement from holding up in the bin, compressed air is injected into the bin through a ¾-in. pipe at 100 p.s.i The air thus introduced into a tight compartment carries some cement in suspension, which is released through a 2-in. pipe located at the rear of the bin. The cement, instead of being wasted with the air, is collected in a sack attached to the end of the pipe, as shown in one of the illustrations.

The weigh batcher discharges by gravity through a sleeve into transit mixer drums. Water, added at the same time, is received from the city supply and measured by a Neptune meter. For cold weather work the water is heated to about 180 degrees, or according to the specifications required. An American Radiator Co. boiler, fired by a Link-Belt stoker, heats the water which is stored in a 1000-gal. tank.

A fleet of 12 Jaeger transit mixers is maintained, 10 high-dump and two low-dump. Nine are 2-cu. yd., two are 2½-cu. yd., and one is 3-cu. yd. capacity. The trucks are cleaned thoroughly every evening, both inside and outside, to help insure a longer life. A man is kept on the payroll for the express purpose of cleaning the mixers at the close of the day's operations. In addition, a well-equipped machine shop is maintained to service the trucks and to keep the entire plant in top working condition. A crew of four mechanics is employed for this purpose.

Jobs at distances too great for delivery from the main plant are served by an auxiliary portable plant consisting of a 2-compartment, 100-ton capacity, Johnson bin, equipped with weigh batcher. This plant can be moved to the job site and set up to serve the transit mixers, and thus cut down on length of haul.

P. J. Crowe is president of the Ready Mixed Concrete Co., H. L. Gray is vice-president, J. H. Smith is secretary-treasurer, and R. F. Owen is general superintendent.

Cement Production

BUREAU OF MINES reports that production of finished cement during April, 1946, totaled 12,650,000 bbl. or 79 percent greater than that reported for April, 1945. Shipments of 15,369,000 bbl. were 95 percent greater than those reported for the corresponding month of 1945. These figures indicate a growing acceleration in both production and shipments in step with the increasing tempo of activity in the construction industries. Mill stocks on April 30 were 7 percent lower than at the end of March, 1946, and 23 percent lower than a year ago. Demand for cement, as indicated by mill shipments, was higher than in April, 1945, in all districts. In 12 of 19 districts (excluding Hawaii), shipments were more than double those of April, 1945.

The following statement gives the relation of production to capacity, and is compared with the estimated capacity at the close of April, 1946, and of April, 1945.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	Apr. 1946	Apr. 1945	Mar. 1946	Feb. 1946	Jan. 1946
The month	64.0	36.0	55.0	50.0	47.0
12 months	50.0	38.0	48.0	46.0	44.0

Pavement Yardage

AWARDS of concrete pavement for June and the first six months of 1946 have been announced by the Portland Cement Association as follows:

SQUARE YARDS AWARDED

	June, 1946	First 6 Mos., 1946
Roads	2,638,762	13,136,160
Streets and Alleys	1,100,206	5,188,657
Airports	746,974	1,583,055
Total	4,485,942	19,907,872

Bombing destruction at Norddeutche plant near Hanover. This was the packing plant and cement storage area

Part II: This is the concluding article based on a study by a board of experts,* dealing more specifically with machinery, its dimensions and performance. First article in July was prepared by M .A. Swayze and the concluding article is the work of G. J. Davis

What Has Happened to CEMENT INDUSTRY In Germany

TECHNICALLY, the standard of works management is below that usually found in England and America. The fact that a large proportion of the industry still uses shaft kilns indicates that little effort has been made to modernize old factories. However, in spite of this handicap the costs appear to be good and labor required for operation is not excessive.

The average man-hours per ton for the whole industry is about 2.5, while the best works reaches a figure of 1.4 (wet process). Power consumption ranges from 80 k.w. per ton to 94 k.w. per ton with a general average of about 85 k.w. per ton.

Quality appears to suffer most as the result of the lack of technical knowledge and shortage of fuel. The shaft kilns in particular produce clinker of a very doubtful quality. The raw material grinding mills, although economical in power consumed per ton of material ground, yield a finished product that is very coarse indeed. In one case the residue on the 4900 mesh sieve is more than 40 percent and the power per ton of material ground to a standard residue of 6 percent or 7 percent on 170 mesh would be very high.

Average fuel consumption is low owing to the large number of factories using the dry process of manufacture. Among those using the wet process, which is standard practice in England, the fuel consumption is about the same. The saving of fuel which results from using the Lepol kiln warrants perseverance in the use of the dry process, although certain losses are to be expected on account of the rather higher power required to grind raw materials in a dry state. The additional cost thus incurred is minimized by the use of closed circuit grinding mills in which the creation of a large quantity of unwanted superfine material is avoided.

The data obtained with regard to the dry process kiln is of interest and show that generally they are underrated in capacity when compared with kilns of the same diameter using the wet process, although they are short in length.

Clinker grinding is carried out on orthodox lines (with one exception) and most of the power figures obtained appear low owing to the coarseness of the standard cement. A residue of 10 percent or 12 percent on the 4900 mesh sieve is general practice.

Packing is generally carried out on 2-, 3- or 4-spout Bates or Modern packers and there is little about the machines or their operation which is not already universally known. The plants are very clean owing to the great use made of dust filters. Large cloth stocking type filters are used universally. Most of them are considerably larger than any in use in similar situations in England. The benefits to be derived from this policy are evident in the cleanliness of the buildings. The ratio of gas to cloth area is 33 cu. meters per hour per square meter of cloth.

Two-ply paper sacks are used for general trade, but three-and four-ply sacks are used for special cements which might have a tendency to deteriorate in storage. Bulk deliveries by rail are made in ordinary box cars. Two-ply paper bags of cement are laid on the car bottom and a wall of sacks to the requisite depth is built around the car ends and sides. The space in the center is then filled with loose cement. Attractive dining rooms, locker rooms and washing facilities were provided in large factories.

Quarries

Overburden was removed and in many cases replaced after the raw materials had been taken so as to restore the agricultural properties of the land. No bulldozers or other mechanical equipment were available for this work, which appears mainly to be done by hand. In many plants the overburden was used as a raw material.

In all cases where it was necessary to blast the raw materials, "tunnelling" or compressed air drilling methods were used. There was no instance where a blast hole drill of the type now used extensively in Britain and America was used and it can be said with confidence that the methods were generally considered out of date when compared with modern practice.

Diesel, steam and electric excavators were used for loading the material into rail cars, but in accordance with the "Guns instead of Butter" policy, most of these are also considered out of date. One large electric excavator was inspected. Mechanically it appeared to be of sound modern construction, but the electrical equipment was nearly 20 years behind modern practice. No "Ward-Leonard" control systems were in use.

Quarry traction is generally by steam on meter gauge track, steel ties frequently being used. One interesting quarry rail haulage system is operated by electric locomotives with an overhead line. The locomotive is fitted with duplicate collector equipment. One collector is for use when the overhead line is directly over the track and the other can be moved out at the side of the locomotive for use when the overhead line

*G. J. Davis, Dr. F. M. Lea, Dr. T. W. Parker, L. C. Hill, M. Gallai-Hatchard, M. A. Swayze.

runs at the side of the track so as to allow the excavator to load the cars without touching the power line. The supports for the power line are of tubular steel construction fastened direct to the base flange of the running rails and suitably curved to avoid fouling the train of cars.

The cars, having arrived at the crusher house, are pushed under an overhead crane gantry. The crane, by means of suitably shaped lifting gear, automatically hooks itself on to the car body and lifts it from the chassis, empties it over the crusher feed hopper and returns it to the chassis. The car bodies are of a special design very similar to a crane grab. They are made in two halves which are pivoted at the top center point. When discharging, the load is taken by the two sides of the car body and the center allowed to drop, the body thus opening like a grab. When the load has been discharged the body is lifted by the center point and the two halves come together again forming a complete container. The other quarries all use the regular side tipping car, which is too well known to require description.

Raw Material Crushing

All works use hammer mills of the conventional type, the "Miag Titan" double hammer mill predominating over the single hammer mill. The reduction of the material for grinding is achieved in one stage. The feeders are generally of the well-known oscillating bar type.

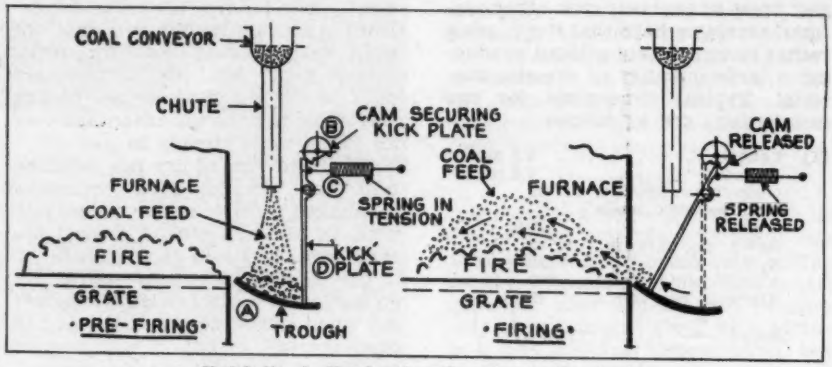
Dryers

Rotary driers are used exclusively and brief particulars are given below of the machines for which the data appeared to be reliable:

Length	Dia.	R.P.M.	Tons per hr.	Air Temperature Inlet	Air Temperature Outlet	Moisture Feed End	Moisture Outlet
20 m.	2	10	25	300°C	80-90°C	6-7%	1-1.5%
20 m.	1.8	10	21	300°C	80-90°C	6-7%	1-1.5%
21 m.	2.25	1	22	600°C	200°C	15%	1-1.5%
20 m.	2.0	5	20	600°C	200°C	20%	2%
22 m.	1.8	5	20	600°C	200°C	20%	2%

Most of the dryers utilize kiln exit gases for heating, but a few have an external furnace of conventional pattern.

One of these furnaces is fitted with the novel automatic stoker shown on Sketch No. 1. It consists of a base plate shaped as a segment of a circle. A small quantity of coal is fed intermittently on to this base plate and a spring loaded flat steel plate moves rapidly under the influence of the spring and throws the coal from the segmental plate on to the top of the fire. The thrower plate is then returned to its original position by means of a cam operation and a further charge of coal is dropped on to the base plate and the cycle of operations resumed.



Sketch No. 1: Novel automatic stoker to fire dryer

Raw Grinding

It is in this field that the Germans differ most widely from standard British and American practice. It is, of course, on account of the widespread use of the dry process. Wet grinding mills do not vary greatly from the types in general use.

There were three main systems used for dry process grinding:

(1) The "Loesche" mill made by Curt von Grueber Maschinenbau A. G. Teltow bie Berlin.

Total per ton per hr.	Fineness of product on 4900 mesh sieve	Power kilowatt hours Fan	Power kilowatt hours Mill	Total power per ton ground
28-30	20%	150	230	13.56
22	15%	160	310	21.37
15	15%	125	170	19.6

(2) Air swept mill made by Humboldt-Motoren A. G. Cologne.

(3) The Pfeiffer mill, which is made by various people.

Of the three systems the Pfeiffer mill appears to be the best, or at any rate the most efficient. The extreme coarseness of the raw material, which is generally used, has led to a large number of the first two types of mills being installed, but the enormous fan power required seems to make the system expensive for a given fineness.

Loesche Mill

The Loesche mill was made in Germany by Curt von Grueber Maschinenbau A. G. Teltow Bei Berlin. In England it is known as the Lopulco mill and is manufactured by the International Combustion Co., Ltd. It consists essentially of a rotating table, on which rests two conical rollers. The pressure which these rollers exerts on the table is controlled by the adjustment of a series of compression springs which extend right across the mill internally. The material is fed down a chute to the table and is crushed by the rollers as the table rotates. A blast of air is directed at the table and extracted from the top of the mill and thus all material as it is ground to the required fineness is removed along with the air.

The details of the performance of three of these machines grinding a hard chalk are as follows:

The Humboldt airswept mill appears to be coming to the fore as a means of grinding raw materials for dry process plants. Many new installations were seen, some of which had not even been run. We were fortunate in being able to obtain general arrangement, dimensioned sketches of the installation at the Mersmann Plant at Beckum, Westphalia.

The general layout requires a fairly tall substantial building, as there is a considerable amount of machinery on each floor. Hot air is drawn from a furnace, situated on the ground floor, through the mill, up an ascension pipe, to a preliminary adjustable cyclone separator, which is similar to one made by the British Rema Co. and installed in various plants in England.

The returns from this separator, which consist of all oversize which is too coarse for production, are fed back to the mill inlet. The fines from the separator are taken to a cyclone where the majority of the required material is removed and approximately two-thirds of the exhaust gases are returned to the inlet in the mill. The remaining one-third is extracted from the system by means of a separator fan and cleaned in a cloth filter, having a total filtering area of 360 sq. meters.

This plant does not appear to have

any great advantages over other systems, except perhaps that it can grind rather more coarsely without producing a large quantity of oversize material. Typical dimensions for two installations are as follows:

(1) Length ..... 4.5 meters
Diameter ..... 2.2 meters
Output per tons per hr. 35
Residue, 4900 mesh sieve 20%
Revol. per minute..... 22
K.W.H. Fan 120
K.W.H. Mill 310
Kilowatt per ton..... 12.29
Speed $\frac{K}{\sqrt{D}}$ 204.7
Ball Load, tons..... 24
Kilowatt per ton of Balls 12.92
Charge percent Volume of Mill 32.6

(2) Length ..... 3.5 meters
Diameter ..... 2.4 meters
Output per tons per hr. 27
Residue, 4900 mesh sieve 20%
Revol. per minute..... 17
K.W.H. Fan 102
K.W.H. Mill 220
Kilowatt per ton..... 11.9
Speed $\frac{K}{\sqrt{D}}$ 165.2
Ball Load, tons..... 22
Kilowatt per ton of Balls 10
Charge percent Volume of Mill 32.3

These figures are very consistent, except as regards the speed, which probably accounts for the different kilowatt hours consumed per ton of ball load. The total quantity of air circulated through the mill was given as 30,000 cu. meters per hour, 12,000 cu. meters of which was drawn from the furnace, the balance being circulating air.

In other countries it is probable the machine would find its greatest use in the production of carbonate of lime for agricultural purposes, but it may not be possible to grind sufficiently fine for raw materials for cement manufacture. In one case the mill was grinding coal for firing rotary kilns, but the performance data of the machine do not in any way show it to be an advantage over air swept mills already in use.

The third type of dry raw grinding mill, the "Pfeiffer Mill," generally consists of a single compartment mill with an air separator. A typical arrangement is shown on Sketch No. 2.

The figures of output and power consumption are remarkably consistent when compared with those it has been possible to obtain with regard to other mills and it would seem that the use of this system could be recommended in preference to either the Loesch Mill or the Humboldt Mill. Output and power consumption are as follows:

Length Metres	Dia.	Output Tons per Hr.	Residue 4900 mesh	R.P.M.	K.W.H.	K.W. per ton	Ball Load Tons	$\frac{K}{\sqrt{D}}$	KW per ton Balls
10	1.8	15.25	20%	23	180	11.8	17	193.6	10.59
10	1.8	19.07	20%	23	225	11.8	21	193.6	10.71
		12.0	10-12% (?)	23	150	12.5			
6	2	22	22%	21	200	9.1	20	165.3	10.0
4	2	16.6	20%	22	160	10.8	16	173.1	10.0

$$R.P.M. = \frac{K}{\sqrt{D}}$$

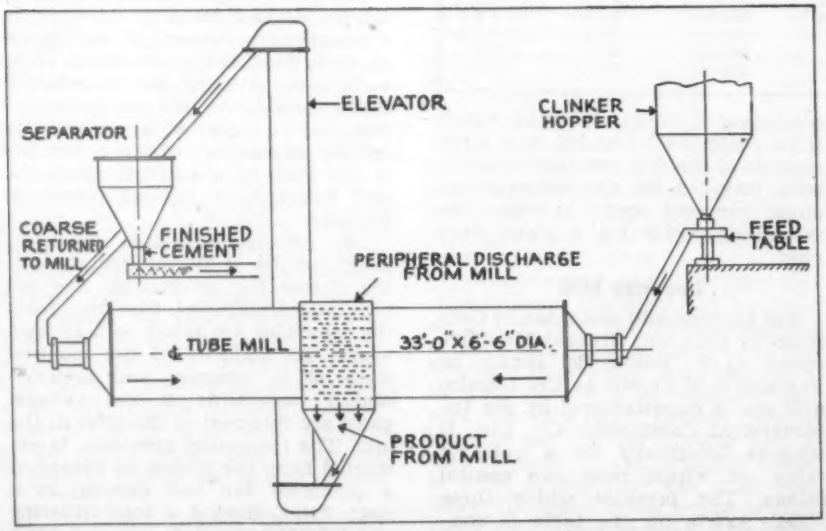
The mill consists of a normal tube mill running at the usual speeds. Several slots are cut in the shell at or near the center of the mill and these slots conform to the position of wide open joints in the lining plates.

The material to be ground is fed through one trunnion bearing of the mill and proceeds in the normal manner to the portion of the shell where the slots are situated. The fines are then discharged through the shell and elevated to a Sturtevant separator or any other of similar manufacture. The coarse material rejected by the separator is then returned to the mill through the other trunnion bearing and discharged through the same slots half way along the mill shell.

Large balls of 120 mm. to 70 mm. diameter are used throughout the mills, there being no dividing diaphragms of any kind. One manufacturer had fitted diaphragms to segregate the balls for preliminary and final grinding, using small balls and cylpebs for the final stage, but he was unable to produce convincing figures showing any improvement.

Several ordinary 2- and 3-compartment combination mills were used. Details are given in the above table:

No. of Comprt.	Length Mtrs.	Dia. Mtrs.	Output tons per hr.	Residue 4900 sieve	R.P.M.	K.W.	K.W. per ton	Ball Load Tons	K.W. per ton Balls	$\frac{K}{\sqrt{D}}$
2	11.0	1.8	25	12%	24	260	10.4	—	—	210
3	8.0	1.85	15	12%	26	280	18.67	25	11.2	222
3	8.0	1.85	15	12%	23.1	260	17.33	23	11.3	197

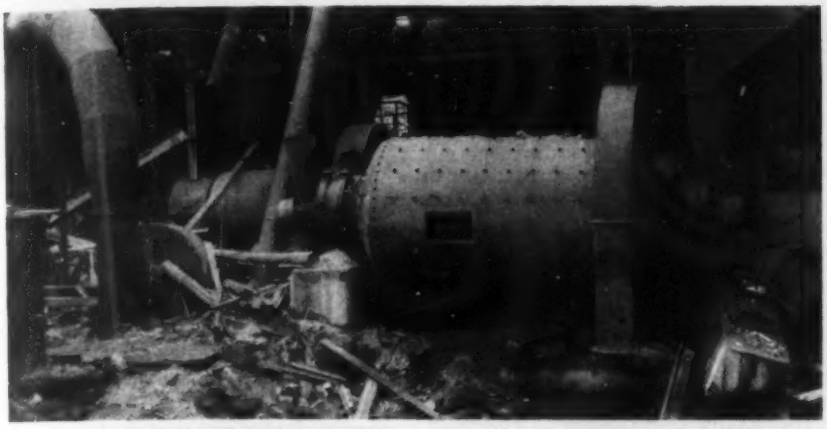


Sketch No. 2: Dry raw grinding mill (Pfeiffer), generally consisting of a single compartment with an air separator

These mills are grinding the material much finer than the previous examples.

The only examples of raw wet grinding were found at the Dyckerhoff plants at Lengerich and at Weisbaden. The Weisbaden plant is unusual in that there is a multiplicity of 36 ball, primary tube and secondary tube mills. There is nothing worthy of note about any of them, except that the overall power consumption is quoted at 19 k.w. per ton for material ground to a residue of 16 percent on the 4900 mesh sieve at 37 percent slurry water.

The Lengerich plant contains a combination mill grinding wet slurry in which the preliminary grinding chamber is larger in diameter than the finishing chambers. Details are shown in table on the next page.



Dry raw grinding Humboldt mill damaged by bombs, Germania Portland Cement Co.

Length	Dia. 1	Dia. 2	Output T.P.H.	R.P.M.	K.W.	K.W. per Ton	Res. 4900	Slurry H_2O	K/√D 1	K/√D 2
12.5 m.	2.5 m.	1.8 m.	23	25	270	11	10-12%	36%	248	210

The extremely high speed in relation to diameter attained in the primary grinding chamber in this mill is unusual and an investigation under operating conditions to ascertain the accuracy of the power consumption and output given would be of interest.

Raw Material Handling

There is little to report with regard to the handling of wet process slurry. Centrifugal pumps are installed at every plant visited and slurry tanks and mixers are on orthodox lines, with the exception of one reinforced concrete storage tank of 5000 cu. meters at the Wiesbaden plant of Dyckerhoff. The main virtue of this enormous tank is the resulting consistency of the kiln feed slurry.

The dry process plants store the ground raw material in small silos built of steel or reinforced concrete. The capacity is usually about 250 tons and air extractors or screw conveyor extractors are used. The blending and correcting of the raw materials is done by extracting material from two or more silos simultaneously and transferring it to another silo.

The effectiveness of this method varies from plant to plant. Some works are fairly consistent and the $CaCO_3$ content of the material does not vary more than 1 percent during the course of a day. Others suffer from violent fluctuations ranging from 78 percent $CaCO_3$ to 81 percent $CaCO_3$ in the course of a few hours. It appears to be a matter which can be made to operate successfully provided that the management is sufficiently interested.

Unfortunately the plant with the most modern equipment for mixing dry raw materials by air was not available for inspection, but it is stated by those who know the process that it is very expensive in power.

Nodulizing Dry Process Raw Materials

Two varieties of nodulizer are in use—one a paddle type pug mill and the other a rotating drum. The pug mill is not so satisfactory as the drum mixer. The quantity of material in the mill at any given moment is so small that the slightest variation in the dry material feed or the water supply results in either a sticky mass of material or a dry powder emerging from the mill. The drum type nodulizer on the other hand appears to deliver a consistent supply of well rounded nodules graded roughly to a similar screening analysis as average clinker. No fine particles were observed and no excessively large lumps.

The dimensions of typical machines are:

Length	Dia.	R.P.M.	Kiln Clinker Output
8.5 m.	3.2 m.	11	12.5 t.p.hr.
4.5 m.	2.8 m.	12	20.8 t.p.hr.
3.0 m.	2.0 m.	20	30.0 t.p.hr.

From these three examples it is apparent that size is not of very great importance.

The material is fed into one end of the rotating drum and a fine spray of water is injected. The material gradually absorbs the water and forms the nodules. The depth of material is maintained in the nodulizer by means of an end plate 15 or 20 cm. deep, with two rectangular holes cut in it which allow the material to come out twice every revolution.

Kilns

Six distinct types of kiln are to be encountered and the prominent one among them is the shaft kiln. A large number of these are in operation and generally they appeared to produce very poor clinker. Their only virtue is a very low fuel consumption, but as they were considered out of date in England and America many years ago, no details are being recorded.

The other types of kiln are:

(1) Lepol.

(2) Rotary dry process.

(3) Rotary wet process using Miag calcinators.

(4) Rotary wet process using Dyckerhoff slurry sprays.

(5) Sinter grate.

The Lepol kiln is well known, but experience in its use is not extensive outside Germany. The fuel consumption is very low and operators expressed themselves to be well satisfied with maintenance costs. Only in two cases was it possible to obtain accurate data with regard to the grate area, but it is probable that it varies in proportion to the output of the kiln. Dimensions are:

Grate Dimensions Length	Grate Dimensions Width	Lepol Kilns Length	Lepol Kilns Diameter	Output T.p.hr.	Fuel Consumption
20 m.	2½ m.	30 m.	3 m.	10.5	14%
20 m.	2½ m.	30 m.	3 m.	10.5	14-15%
Not obtainable		35 m.	3.2 m.	12.5	14%

The drying and decarbonating of the raw material takes place on a chain grate in many respects similar in design to an ordinary chain grate stoker. The grate chamber is divided into two compartments by a dividing wall, which extends downward to within about 6 in. of the top of the bed of material on the grate. The purpose of this division wall is to control the proportion of hot gas used for drying and for decarbonating.

The material is fed from the nodulizer on to the chain grate and spread evenly over its surface to a depth of 7 or 8 in. The slow movement of the grate gradually takes the raw meal from the drying chamber to the decarbonating chamber and finally deposits it in the rotating part of the kiln. The hot gases from the rotary kiln are drawn through the bed of material by an induced draft fan and extracted from beneath the grate. The restriction through the material is about 3½ in. W.G. The very low fuel consumption of this kiln would appear to warrant serious attention.

The plain rotary kiln in dry process

plants appears to have a very consistent coal consumption of 22 percent standard coal to clinker. Details of representative kilns used in this manner are:

Length Mtrs.	Diameter Main Burning Zone Mtrs.	Mtrs.	Output Tons per Hour	Coal Cons. % Clinker
35	2	2	2.08	24%
29	2.9	2.9	9.2	20%
56	2.1	2.5	6.25	22%
56	2.5	2.5	7.9	22%
76	2.6	3.4	8.3	22%
45	2.0	2.5	5.83	23%
60	2.8	2.8	10.0	22%
60	2.5	3.0	10.0	22%
55	2.5	2.5	5.42	22%
50	2.8	2.8	8.3	22%
65	2.3	2.8	9.17	22%
50	2.8	2.8	10.2	25%
50	3.0	3.0	13.3	25%
60	2.75	2.75	8.3	21-22%
78	2.5	3.4	7.5	22%
Waste heat boiler 1600 K.W.H. generated.				

Output of clinker is low in all cases when compared with standard practice on wet process and as any increase in tonnage would result in an increased coal consumption there would not appear to be any substantial economies to be effected by adopting this process.

Manufacturers in Britain and America have experience in the use of Miag calcinators and it is not necessary to do more than state that experience in Germany confirms opinions already expressed that the fuel efficiency is good, but dust losses tend to be rather high.

The slurry spray system of feeding kilns was tried out in England some years ago and the results of German experiments do not give any additional information. So much dust is created that electrical precipitation is essential while the resulting coal consumption of 24 percent standard coal to clinker at 37 percent slurry moisture is not appreciably better than can be obtained from a longer kiln with very much lower dust losses.

The "Sinter Grate Machine" is an entirely new development which may well warrant further investigation. Three machines have so far been put into commission. Two of them are in the Russian occupied portion of Germany and one in the French Zone. Unfortunately there was not sufficient time available to visit Dotternhausen and to comply with all the requirements of the French Occupation Authorities, but a fairly comprehensive description and certain drawings of the machine were obtained and it is recommended that this target be thoroughly investigated.

Sketch No. 3 shows in line diagram form the principle of operation of this machine. It consists essentially of a series of trays with sides 18 in. deep and perforated bases. The trays are mounted on a frame connected to a smoke box which is exhausted through a cyclone separator by an induced draft fan. The principle of operation is as follows. The base of the tray is first covered to a depth of about 2 in. with clinker, which will pass through a —8 + 6 mm. mesh screen in order to protect it from the heat. On top of this clinker is placed the material to be burned together with the requisite quantity of fuel. In practice this is done by mixing —6 mm. mesh clinker with a weighed quantity of raw materials and a weighed quantity of fuel and mixing together in a pug mill with about 10 percent of added water. The tray thus loaded is slowly moved under an ignition arch which may be either oil or gas fired and the top layer of material is ignited. By the time the tray is under the ignition arch it has also passed over the smoke box which is under suction and the gases of combustion are drawn down through the bed of material thus igniting the fuel

Radex skew wedge magnesia refractory brick used by German cement plants is backed up with fireclay brick

in the mixture. When the tray emerges from the ignition arch the top layer of material should be completely burned and cooled off to a black color and as the tray slowly progresses over the top of the smoke box the fire is drawn down right through the bed of material until complete combustion has taken place by the time that the tray reaches the end of the machine. The tray then discharges its burden into a roll-type crusher and returns underneath the machine to the loading end once again. By the use of a multiplicity of trays the operation is made continuous.

The resulting clinker is taken from the crusher, up an elevator and deposited in a screen where it is separated into three sizes, the —6 mm. being placed in a hopper for convenient mixing with raw materials. The —8 + 6 mm. clinker is conveyed to another hopper for forming the protecting layer for the tray and the + 8 mm. material is taken away for grinding into cement.

The advantages claimed for this system are:

(1) Low capital cost.

(2) Low maintenance cost by eliminating brick linings for kilns.

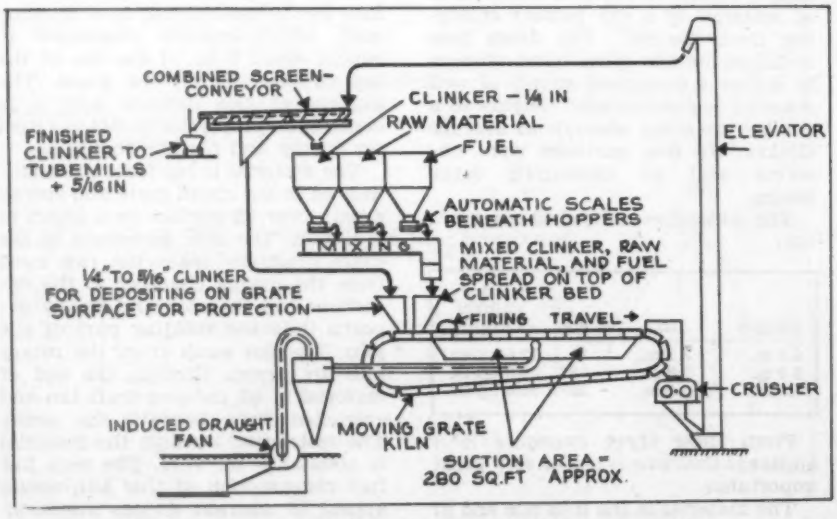
(3) A great economy in building costs.

(4) Low fuel consumption.

(5) Very low grade fuel used.

The output of the machine is roughly 10 tons of clinker per sq. meter of grate area, but the machine at Dotternhausen has a grate 2 meters long and makes 300 tons of portland cement clinker per day.

Mr. Nils Young of Messrs. Fellner and Ziegler has obtained German Patent No. 735258 dated April 8, 1943, for an improvement to the above machine in which he uses crushed limestone to protect a permanent grate and the material is made to progress by vibrating the grate electrically. There would appear to be no advantages in the Fellner and Ziegler adaptation, except the saving of a certain amount of headroom by elim-



Sketch No. 3: Shows principle of operation of sinter grate machine

certain amount of headroom by eliminating the large sprocket wheel which returns the trays to the top of the grate, but there are distinct disadvantages which can result from having partly burned limestone mixed with the clinker and there are also difficulties in obtaining an airtight joint between the vibrating grate and the draft fan.

Coal Grinding

Nothing worthy of comment was observed in this process. Most plants used plain tube mills with independently fired driers. Ir no case was hot air extracted from the coolers for coal drying. Loesche mills and air swept mills were also in evidence.

Coolers

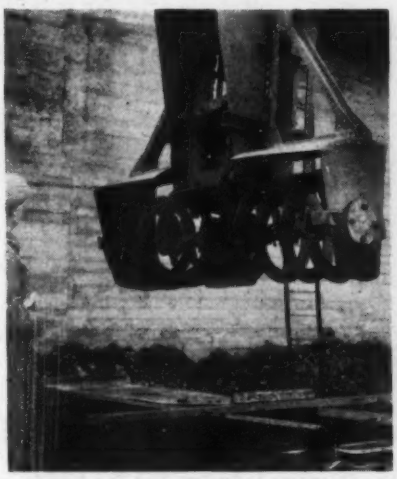
A strong preference for the rotary cooler was expressed by all plant operators. Very few examples of the integral cooler were found and only in three cases were coolers of unusual design in use and these were stated to give a lot of trouble with consequent heavy maintenance costs.

Clinker Handling

Generally, clinker was conveyed on shaker-type tray conveyors though the design was different from that usually installed in England. The trays are vibrated mechanically at a high speed and some very ingenious devices were employed to obtain this vibration. It was not done electrically in any of the conveyors seen.

Clinker Grinding

A schedule of a representative selection of clinker grinding mills shows that there is little deviation from standard practice. Two and three chamber combination mills are in use, but there is very little difference in efficiency.



Wittekind coal unloader used in Germany

liese plant near Beckum is used for grinding clinker or raw material, but the performance data are so poor that they are not worth recording.

Packing plants in all cases conform to conventional design, the "Modern" packer made by Haver & Boeker being the principal machine in use. The output obtained from each machine conforms to British and American experience. The advantage of installing large dust filters is evident and very few buildings show signs that the machines are dirty in operation.

Coal Unloading

An ingenious device for unloading railway cars was noted. It consists of a bucket elevator, which lifts the coal from the car and transfers it to a belt conveyor running over a large coal storage. Attached to the bottom drum of the elevator are right and left hand screw conveyors so arranged that the overall length of the screws and the elevator buckets is exactly equal to the width of the car. The elevator is lowered into the car and the two screws convey the coal towards the center where it is lifted up by the elevator buckets. The device is installed on a travelling buggy so that it can be centered over a car in any position and can move along the car from end to end.

Electrostatic Precipitators

Electrostatic precipitators are of conventional design with the exception that the latest installations are fitted with hollow collecting electrodes. The electrode takes the form of a hollow plate with louvres punched at intervals of about 18 in. down its length. A greater efficiency is claimed for this type of electrode because the dust, when it is shaken off the surface, drops down through the louvre to the inside of the plate and is conveyed to the base of the precipitator without coming into contact with the gas stream.

Length Mtrs.	Dia. Mtrs.	Tons per Hour	Residue 4900 mesh	R.P.M.	K.W.H.	$\frac{K}{\sqrt{D}}$	Load % of mill Volume	K.W.H. per Ton
13	2.0	16.5	14%	22	370	195.5	22.36	22.43
12	2.0	15.5	15%	22	320	195.5	27.81	20.65
12	2.2	20.0	15%	22	380	204.0	28.52	19.0
11	2.0	12.0	10%	21.5	340	191.1	30.55	27.2
11	1.85	9.0	10%	24	270	203.6	18.77	30.0
12	1.85	10.0	10%	24	280	203.6	25.82	28.0
14	1.85	15.0	5%	21	440	178.2	24.4	29.33
15	2.0	13.0	10%	22	350	195.5	19.79	26.92
14	2.4	22.0	12%	23	600	223.0	24.31	27.28

The ratio of load volume to mill volume varies widely, but the speeds are much more consistent than the raw grinding units. Power consumption is not good when the coarseness of the finished product is taken into consideration.

The last mill is unusual in that the final grinding compartment is divided axially into four segments and the load equally distributed between the segments. There does not appear to be any advantage in this arrangement. One Pfeiffer mill at the Anna-

Cement Quality—Specifications

(Continued from article on German Cement Industry in July Issue)

Assessment of quality of German cements in comparison with British and U. S. products was not possible, due to differences in German methods of test for strength. Specifications on strength were changed in July, 1942, and new methods of test instituted at the same time. Their old earth-dry mortar in briquettes and cubes was abandoned, and a new plastic mortar consisting of 1 part cement, 1 part fine ground sand, 2 parts of their old standard with addition of 15 percent water substituted. The new test specimen is a 4x4x16 cm. prism, molded in two layers with a puddling paddle with 2x15 cm. face. Three specimens are tested in flexure for each age of test over a span of 10.0 cm. center loading. The fractured ends are then subjected to compressive tests as modified prisms, on a machine with bearing faces 4.0 x 6.25 cm.

Experience some years ago with a similar mortar, by members of the Working Committee on Plastic Mortars, ASTM Committee C-1 on Cement, indicated that mixes containing very fine sand would yield abnormally high strengths, as compared with 20-30 standard sand or graded Ottawa sand mixes of the same water-cement ratio. For this reason the following German strength requirements may have to

MORTAR STRENGTH IN KG/CM²

	1 Day	3 Days	7 Days	28 Days
Cement 225 (Ordinary)				
Flexure			25 (335)	50 (710)
Compression			110 (1565)	225 (3200)
Cement 325 (High Strength)				
Flexure		30 (425)	40 (570)	60 (850)
Compression		150 (2130)	225 (3200)	325 (4620)
Cement 425 (Highest Strength)				
Flexure	25 (355)	50 (710)	60 (850)	70 (995)
Compression	100 (1420)	300 (4270)	360 (5120)	425 (6040)

Note: Figures in parenthesis ( ) are equivalent lbs./sq. in.

be discounted materially before comparing them to strength developed by either American or British cements.

In order to determine equivalent values by British and U. S. standards, a sample of the fine ground German sand will be used in an English cement laboratory in the German mix with several English cements, testing also being made by English standards. Similar tests will be run in the United States. A separate report of the data obtained will be submitted.

Most German cements, according to information received, are sold to pass requirements for Cement 225 only. Portland, eisenportland and hochofen cements are made to meet these limits. Cement 325 includes only portland and eisenportlands. Only five plants have made a product meeting Cement 425 strength limits. These portland cements are made by fine grinding a high lime mix, hard burning at reduced kiln output, and finely grinding the resultant clinker, much as in American practice. In addition, at least two of these plants have interground with the clinker 0.3-0.4 percent of calcium chloride, which has a well-recognized accelerative action. Production of this highest strength cement was reported to be small, and used only where rapid hardening and high ultimate strength was essential. None of it was used in the Siegfried or West Wall construction according to reports. Production was abandoned during the last year of the war in favor of greater outputs obtainable on lower strength grades.

The use of granulated blast furnace slag as an admixture with cement clinker appears to have been encouraged during the war in order to save coal. Plants which had produced nothing but straight portland cement used 20 to 25 percent slag to make eisenportland, which by specification may contain up to 30 percent slag. Plants making eisenportland also produced hochofen cement which may contain up to 85 percent slag by specification. Haulage of slag by rail extended from the source to plants as far as 100 km. distant. Since the slag contained considerable amounts of water (25-30 percent) it would appear that its use was more of a war economy in coal consumption than an attempt to reduce cement costs, except where the cement plant was close to the source of slag.

Chemical Control

The usual determinations of percentage calcium carbonate in the raw mixture as ground, and retests as the mix was fed to the kilns, seemed to comprise the only consistent means of chemical control. Determination of carbonate content was generally made by acid-alkali titration, although a few laboratories still used the calcimeter method. Tests of the mix as ground were made at hourly or 1½ hr. intervals. Checks on kiln feed were run at 2 or 3 hr. intervals. Most dry process laboratories seemed content with control within a 1.0 percent spread of carbonate; one instance was found where the mix had varied from 77.0 to 80.8 percent on kiln samples during one week!

Chemical analyses of the finished product were rarely run. Some plants professed to have no analyses of their own, and showed results of monthly tests run by the Cement Association laboratories of the district, who were in charge of all cement inspection for plants in their area. It was only after continued questioning at plant after plant that it became clear that the German industry has far less interest in chemical composition than is shown in the United States, where daily analyses are the rule rather than the exception. While many laboratories had been badly smashed by Russian slave labor after their liberation as reprisal for their former treatment, two were found in a completely undamaged state, with chemicals, equipment and records intact. In both these cases complete physical tests of cement were found, but their records failed to show chemical compositions as determined by their own staff.

This evident lack of interest in composition can be explained to U. S. A. producers only by reference to the following facts:

1. The German cement specifications do not cover the various types of cement constitution now in use in the States for different types of use, but confine themselves purely to three grades based on strength differences only. Production of moderate or low heat cements or sulphate-resistant types seems to be nil. Use of air-entraining agents either interground with the cement or added at the mixer is unheard of.

2. In the case of all plants visited, the raw materials from the quarry showed little evidence of variation in quality, which should tend to make for uniformity in silica: iron ± alumina ratios, and in ratio of alumina to iron oxide. Magnesia contents were low in the areas visited, according to such analyses as were available. Under these circumstances, there need be less concern over composition, once the correct quantity of calcium carbonate in the raw mix is determined, either by cut and try methods, or by the trend of physical tests.

Physical Testing

All plants visited which were grinding cement were making a complete series of physical tests daily. These consisted of fineness tests on the 4900 metric sieve, setting time determinations, soundness tests on pats, and making of prisms for strength tests. All laboratories seemed to be equipped with prism molds and were using them, although a few were continuing to make the old style 5 cm. cubes with the earth-dry mortar (8 percent water). Practically no briquette testing was seen, nor molds found in use.

New Cements

With the exception of the five plants which produced "Höchstwertig" (Highest strength) portland cement, no new products were found of the portland type. The five plants which produced this highest grade were as follows:

Alemannia plant at Hoever, near Hannover.

Heidelberger plant at Weisenau.

Buderus plant at Wetzlar.

Adler plant at Rudersdorf.

Dyckerhoff plant at Wiesbaden-Amoneburg.

Three of these plants were visited and the personnel questioned as to their methods of production. All agreed that the raw mix had to be higher in lime and much finer ground than for the other two grades. Burning was intensified by decreasing kiln output and carrying a higher kiln temperature. Finish grinding was also to a high fineness. Two of the plants also added 0.3 percent to 0.4 percent calcium chloride to the cement in order to obtain the desired strength. Since the addition of this accelerator seemed to be necessary, the inherent strength of the basic cement itself at these two mills must have been lower than at the third plant, where no such addition was required. One of the producers claimed that the clinker contained less than 2 or 3 percent dicalcium silicate, and less than 0.5 percent uncombined lime. These data seem incompatible with each other in light of new information on cement constitution, especially since the main laboratory of the company was poorly equipped for accurate chemical determinations.

A high strength cement of non-portland type was reported by one company, which had experimented with a "sursulphate" cement. This product consisted of 80 to 84 percent of high-calcium granulated blast furnace slag, 15 percent of dead-burned gypsum, with 1 to 5 percent portland cement clinker as an activating agent. An additional slag requirement was that it should preferably contain 18 percent or more alumina (Al_2O_3). The mixture was ground to a very high fineness in a laboratory mill. No adequate measure of fineness in terms of any meaning to American or British investigators were available, but doubt as to ability to duplicate the fineness in commercial sized mills was expressed.

None of the cement has been made in the plant.

This cement was reported to develop compressive strengths above that of the highest grade portland, and in one year's time a tensile strength (flexure) almost twice that of portland, when stored in water. The product was said to have low heat of hydration, and very low expansion and contraction values in wet and dry storage. One prism broken at age of one year showed 90 Kg/cm² in flexure and 720 Kg/cm² in compression. The exterior of the prism was somewhat soft, and of a yellowish-green color. The interior of the specimen was very hard, and a greenish black in color.

Information from other sources revealed that these "sursulphate" cements made in other countries have a good record for stability under water, but do not stand weathering at the waterline or above. Pavements and similar exposed surfaces are reported to become chalky at the surface and withstand wear poorly.

Production of Cements, Northwest District of Germany, 1944

An analysis of 1944 cement production and distribution in the Westphalian, Hannover, Unterelbe (Hamburg area) and Rheinland areas was obtained. Production by groups, compared with productive capacity, for these areas was as follows:

Area	No. Plants Total	Inoperative	Capacity, Tons	Production, Tons
Westphalia	34	14	5,742,000	1,088,165
Hannover	11	2	1,993,500	602,230
Unterelbe	5	0	1,358,000	608,673
Rheinland	4	1	578,000	245,590
	54	17	9,671,500	2,544,658

Distribution of this production as to composition and quality grades for the district was given as follows:

Type of Cement	Strength Grade	Total Tons	Percent of Total
Portland Cement..	225	1,486,747	58.43
" high strength	325	182,503	7.17
" highest stren.	425	22,484	0.88
Eisenportland	225	609,446	23.95
" high strength	325	20,366	0.80
Hochofen Cement.	225	217,772	8.56
" high strength	325	None	....
Erz Cement (Aluminous)		194	
Trass Cement		4,860	0.21
Other Cements		286	
		2,544,658	100.00

These figures show a decided increase in production of cements containing granulated slag, and a decrease in production of the straight portland products as compared to 1937. The production of trass cement has been confined to the Eifel region of the Rhine, and has therefore never been large. However, the new data show a decrease for this product. The comparative figures for 1937, which included all of German production, with 1944 output for the Northwest district are:

Looking down kiln room of Germania Portland Cement Co., showing extensive damage by bombing

	1937 Tons	%	1944 Tons	%
Portland Cement	10,310,000	82.5	1,691,734	66.48
Eisen Portland	1,090,000	8.7	629,812	24.75
Hochofen Cement	900,000	7.2	217,772	8.56
Trass Cement, etc.....	200,000	1.6	5,340	0.21

The above data are a good illustration of the trend in the German cement industry induced by war conditions. The investigators were told that other districts not covered by production data showed similar increases in use of blast furnace slag, often in plants where nothing but portland had previously been produced.

The decline in production of trass cement is of interest, since the figures for both years apparently cover its total production. In 1938 Reichs auto roads in the Eifel area had already begun to show scaling and other signs of distress. It was understood that trass cement had been used on at least some of these sections. During progress of the present investigation some of the same roads were traversed; and it was found that they had been given an asphaltic top coating.

In light of experience with surface scaling of highways in the States, it seems probable that much benefit may be derived by a careful study of methods used by German engineers in the construction of these auto roads. In general, it has been the distinct impression of the cement production investigators that the German cements have been inferior in quality to either English or U. S. products. The almost universal use of combination mills in grinding the cement has precluded any chance of inadvertent additions of oil or grease to the cement which would have increased its resistance to frost action and other wear. Knowledge of this beneficial action of air-entraining agents seem to have been entirely lacking within the industry.

With cements certainly no better than those in use on highways in the States, and in the absence of air-entraining agents to enhance concrete durability, the excellence of German road surfaces must be attributed to their methods of design and construction. A close study of these methods by both Federal and State Highway Engineers would be warranted.

Not the least of differences in concreting practice is an observed delay in finishing concrete surfaces. This was observed on auto road construction in 1938, when finishers were working the surface almost up to the time when the concrete had an initial set. The same practice has been seen this year in the finishing of precast concrete units.

The general conclusions of the investigators are given in the summary of the report. Briefly, they are as follows :

1. The German cement industry has not developed any improvements in cement quality, but has instead purposely reduced quality to some extent in order to economize on fuel and to utilize greater amounts of slag which would otherwise be a waste product.

2. No advancement has been made in the methods of cement production by the wet process method, but a number of new machines have been developed that may be of interest to dry process manufacturers.

3. Retention of vertical kilns for production of cement clinker of poor uniformity and poor general quality is interpreted as an illustration of the German users' relative indifferenec to cement quality.

4. The general excellence of concrete in German roads and structures, in the face of the evidence as to the cement's lack of uniformity, should be an incentive to more careful practice in placing, finishing and curing concrete in England and the U. S. A.

A MECHANICAL VIEW of Flotation Processes

Part 2: Mineral preparation steps essential to efficient flotation

By JAMES A. BARR, Jr.

DURING the past twenty years, non-metallic froth flotation processes have gradually evolved from each new venture until today flowsheets in general have many unit processes and mechanical units in common. Unfortunately, however, we are passing through that period which is especially noted for froth flotation preparations at relatively coarse mesh sizes. The separation by froth flotation processes of non-metallic minerals, which have a top size of about 20-mesh and a lower size limit of about 325-mesh is decidedly less difficult to attain, once a suitable method is found, than for those non-metallic minerals which require a 325-mesh grind for relatively complete mineral liberation.

Present day mineral dressing problems are pressing the processes into that particle size range which, since froth flotation methods were discovered, has been known as slime. The definition for slime is very indefinite, since it must be governed by each individual problem. However, the definition usually is all inclusive for it must cover up a host of troubles and difficulties which an operator may encounter from day to day. In the light of our present knowledge, slime particles must be considered to be those mineral particles which approach one micron in size and therefore present such enormous and highly active mineral surfaces that normal froth flotation process procedure cannot be adhered to. Minerals such as kaolinite, talc, sericite, mica and other easily slimed foliated silicate minerals are old time offenders. They were considered a necessary evil to be rid of by the most expedient method as soon in the flowsheet as was economically possible.

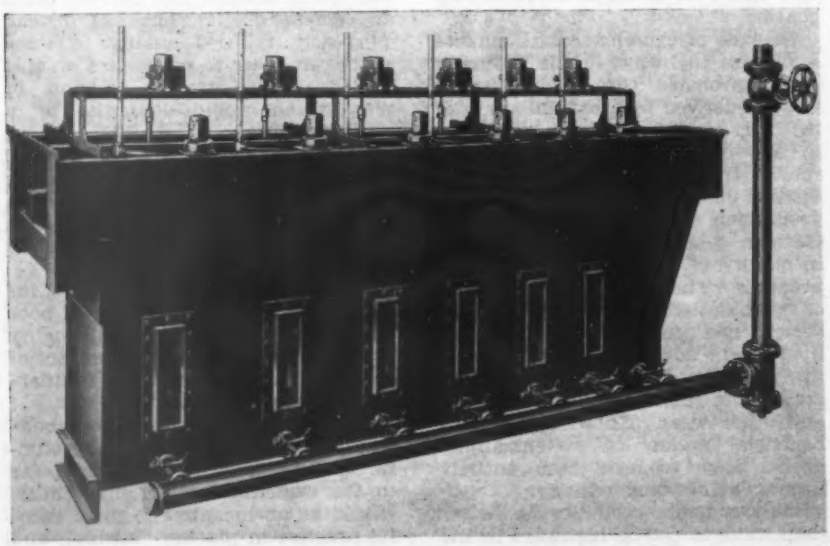
Slime to Industrial Minerals

The discovery of the cationic flotation reagents changed the awful slimy minerals in cinderella like fashion overnight into highly desirable non-metallic industrial mineral products of excellent quality. High molecular weight aliphatic amines and their water soluble salts are specific reagents for froth floating silicate minerals. Possibly slime flotation as applied to non-metallic minerals should be thought of as a froth flotation process which makes it possible to selectively separate minerals occurring naturally or by grinding for mineral liberation purposes finer than 325-mesh. I have for some time felt that the word slime should only refer to those gangue (unwanted) minerals which offer such extreme difficulties that they should be eliminated for economy reasons. It may not always be necessary that they be totally eliminated since, by use of dispersants and specific depressants, it is entirely possible to develop processes quite unaffected by slime particles.

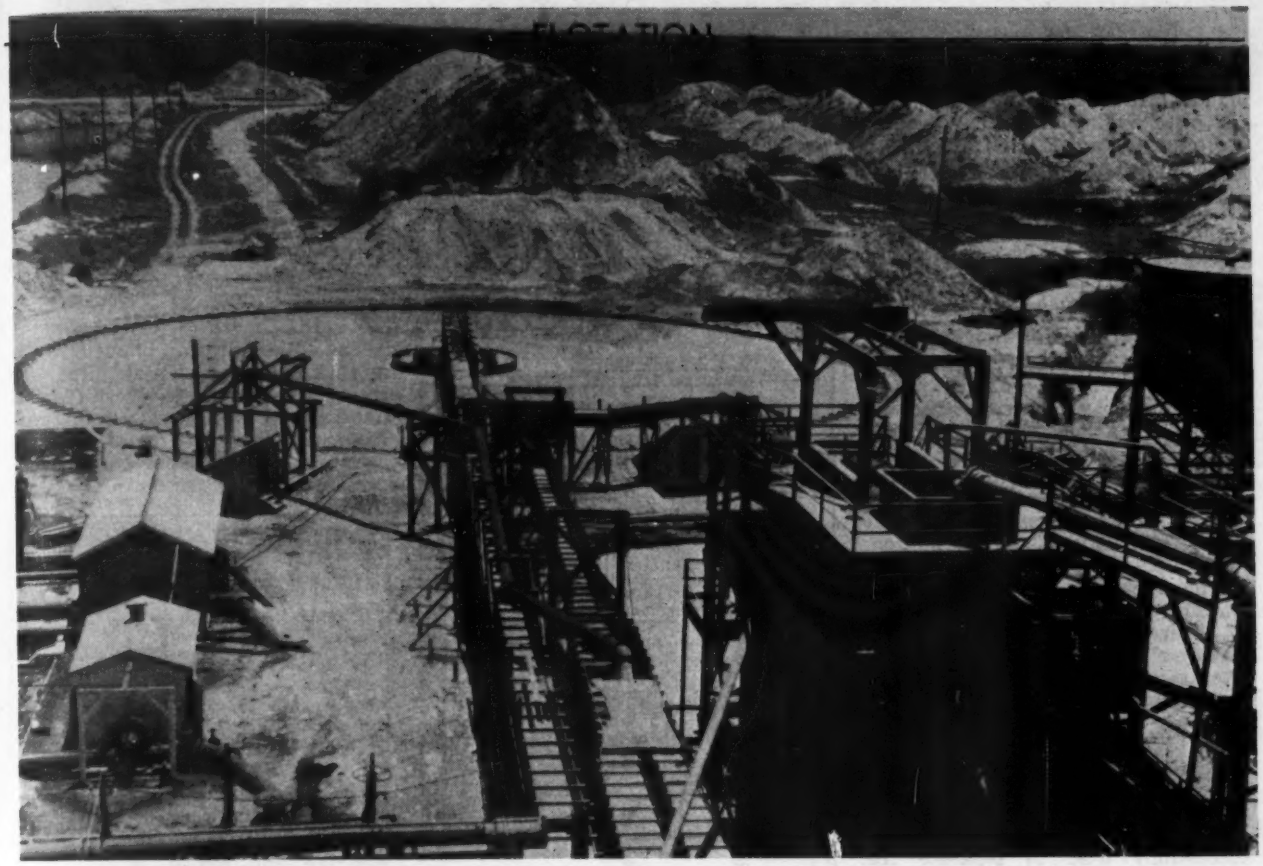
Non-metallic minerals are in most instances weathered to the extent that the mineral surfaces are not clean. The accompanying minerals often are of such a nature that extremely fine particles are sloughed off in the reagent conditioners and froth flotation cells. Since this condition is inherent to non-metallic minerals, special attention must be given to the proper preparation of minerals which are later to be treated as flotation feed. Proper preparation of non-metallic ores and mineral surfaces is by far the most important consideration of a process for separating non-metallic minerals by froth flotation methods. It is for this reason (mineral preparation) that so much mechanical effort is expended in the form of scrubbers, washers, sizers, bowl hydroseparators, rake classifiers and the like, prior to the actual flotation circuit which may require a very small amount of power and floor area in relation to the flotation plant as a whole.

Four Classes of Flotation Separation

From a mechanical standpoint, the selection of a suitable flowsheet is governed roughly by the grain size range at which the non-metallic ore is to be separated into its component mineral parts, and by the physical characteristics of the accompanying minerals. There are four general classes into which most flotation separations will fall. Class I. The hard unaltered non-metallic ore, liberated at coarse mesh size, for which only a very simple flowsheet is necessary. Sufficient mineral liberation is often attained at a —14-mesh grind. Class II. Those ores which are not liberated until ground to approximately 100-mesh or which, though liberated by natural forces, must be treated in the —100-mesh range. Class III consists of those non-metallic ores which must be ground to —325-mesh or which occur naturally disintegrated so that the maximum particle size is 325-mesh. Class IV may include the grainsize ranges of any of the preceding three classes, but the mineral preparation section must be decidedly more complex for the reason that large amounts of clay-like slimes from marine or replacement origin



Sizer employed to separate ground particles into one or as many size bands as may be required for proper treatment by tables or flotation method



Looking down at Fahrenwald sizer section of Peace Valley, Fla., plant of International Minerals & Chemical Corporation and 75-ft. hydroseparator used for classification and desliming. In the background may be seen the 150-ft. hydroseparator rejecting a waste slime

are a part of the matrix or ore to be treated.

Class I

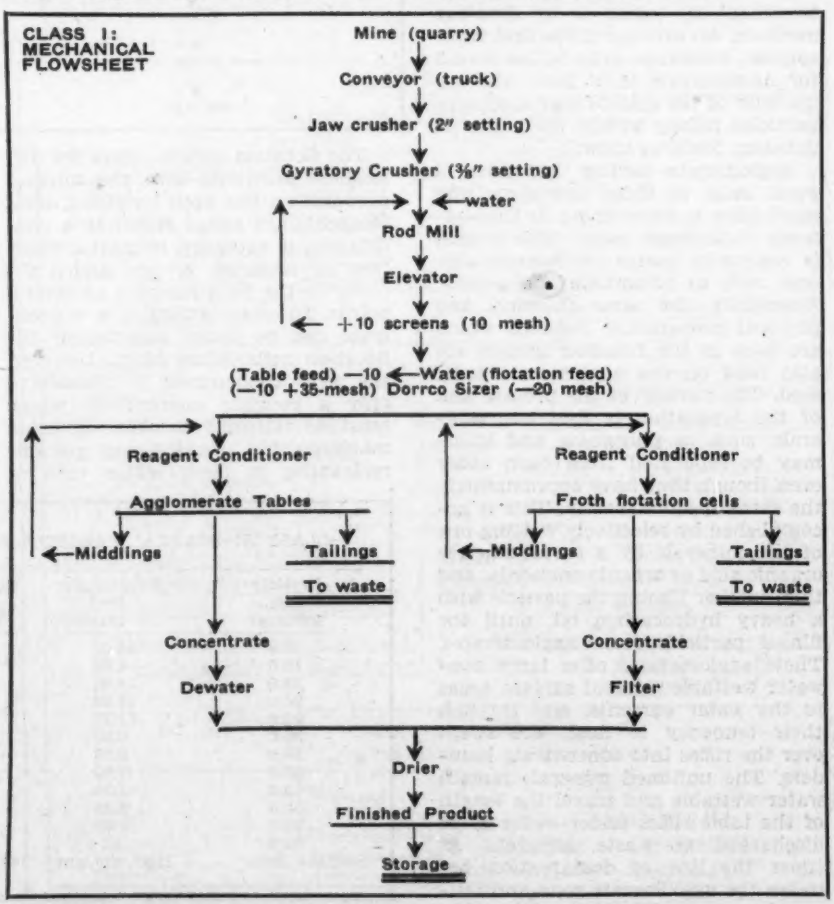
Assuming that sufficient mineral liberation is attained at a 10-mesh grind, the mechanical flowsheet for Class I would be approximately as follows:

CLASS I: MINERAL PARTICLE SIZE
Agglomerate table feed

Mesh size	% Weight retained	Cumulative % retained
8	Trace	Trace
12	5.0	5.0
16	20.0	25.0
20	30.0	55.0
28	25.0	80.0
35	15.0	95.0
—35	5.0	100.0

Flotation Feed

Mesh size	% Weight retained	Cumulative % retained
14	Trace	Trace
20	2.0	2.0
28	7.0	9.0
35	22.0	31.0
48	24.0	55.0
65	14.0	69.0
100	10.0	79.0
150	6.0	85.0
200	5.0	90.0
—200	10.0	100.0



DISCUSSION: Such a flowsheet presents the operator with relatively few operational and maintenance difficulties. Hard, unweathered permatite ores which have large mineral

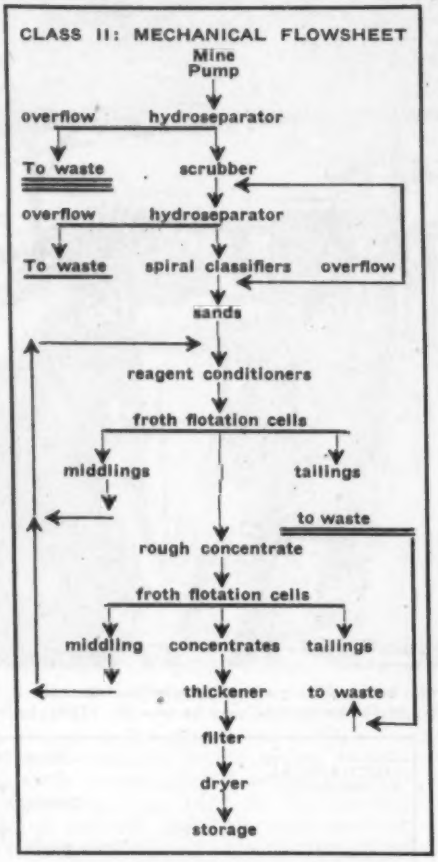
crystals are readily treated and concentrated by this method. Whenever there are more than two minerals to be concentrated, variations of the flowsheet are made to treat the ground mineral particles in several flotation sections by the use of different flotation reagents. Mechanically, however, the flowsheet remains essentially the same.

Ore Preparation Increases Selectivity

Preparation of the ore in the coarse size section may be accomplished by any of the standard units for particle size reduction. Jaw crushers, gyratory crushers, or roll crushers are generally employed to reduce the mine run ore to 4-mesh. To prevent excessive fine particle size formation, rod mills are used to further reduce the particle size until sufficient mineral liberation has been accomplished to assure the required grade and quality of concentrate. The rod mill often serves to polish the surfaces of the mineral particles, and thereby increases the selectivity of the reagent toward a specific mineral. This increase in selectivity is usually followed by a corresponding decrease in reagent cost.

The Dorrco sizer has been very successfully used to separate the ground particles into one or as many size bands as are required for proper treatment by tables or by flotation methods. An average of the first three spigots' discharge may be as shown for Agglomerate table feed. The remainder of the spigots may discharge particles falling within the range of flotation feeds as shown.

Agglomerate tabling has been a great help to those operators who must have a concentrate in the —4-mesh + 35-mesh range. The process is especially useful on non-metallic ores such as phosphate and potash. Essentially, the same chemical and physical preparation methods which are used in the flotation section are also used on the agglomerate table feed. The novelty of the process and of the separation is that two minerals, such as phosphate and silica, may be separated from each other even though they have approximately the same specific gravity. This is accomplished by selectively wetting one of the minerals by a surface active organic acid or organic ammonia, and then further filming the particle with a heavy hydrocarbon oil, until the filmed particles form agglomerates. These agglomerates offer large non-water wettable mineral surface areas to the water currents, and through their tendency to float, are swept over the riffles into concentrate launders. The unfilmed minerals remain water wettable and travel the length of the table riffles under water to be discharged as waste minerals. At times the line of demarcation between the agglomerate zone and tailings mineral zone is not too well defined. Therefore, to assure a high grade concentrate, a middling cut is returned for retreatment.



The flotation section offers few difficulties providing that the mineral preparation has been carefully done. Reagents are added either to a conditioner, if extended reagent contact time is required, or are added directly to the flotation cells at several points. In some instances, a concentrate can be taken directly off the flotation cells. More often, however, the first concentrate is considered only a rougher concentrate which must be returned to other flotation machines for cleaning and possibly recleaning in fresh water with or without additional reagents. Middling fractions containing both wanted mineral and unwanted gangue minerals are returned to the reagent conditioner or to the flotation rougher section for retreatment. The concentrate is dewatered, dried and stored, or further prepared to meet market specifications.

Class II

The only significant changes in the mechanical flowsheet required for treating the minus 100-mesh Class II minerals are the departure from separating and settling units of small area and more emphasis on slime dispersion and elimination.

CLASS II: MINERAL PARTICLE SIZE

Mesh size	% Weight retained	Cumulative % retained
80	2.0	2.0
100	5.0	7.0
150	15.0	22.0
200	22.0	44.0
325	30.0	74.0
20 microns	16	90.0
10 microns	8	98.0
5 microns	2.0	100.0

Discussion: Due to increased fineness of particle size, mineral preparation becomes more difficult. Coarse grinding and coarse separation of particles by screens give way to large settling area units such as bowl rake classifiers, hydroseparators, and other equipment which may be used for scrubbing mineral surfaces.

Agglomerate tabling and straight gravity tabling separations give way to froth flotation methods. The capacity of a table section becomes too low to be economical in most instances.

Froth flotation methods may be altered somewhat to include more cleaning operations, for the mechanical entrainment of gangue minerals in the froth zone becomes more evident.

Class III

Many large tonnage operations are actually grinding to —325-mesh in order to liberate the minerals. This extreme grinding of non-metallic

CLASS III MINERAL PARTICLE SIZE: ORE GROUND TO LIBERATION

Particle size microns	Centrifuge feed % minus	Centrifuge product % minus	Centrifuge effluent % minus	Flotation product % minus
7.5	24.05	20.29	92.20	16.61
10.0	6.65	6.42	0.44	7.0
15.0	16.80	17.32	1.26	17.26
20.0	16.82	16.05	0.88	19.71
25.0	11.77	12.15	1.13	13.25
30.0	6.20	7.56	....	7.87
35.0	6.00	4.64	....	5.58
40.0	1.92	4.58	3.79	2.14
45.0	1.74	1.30		1.74
50.0	2.44	1.94		2.32
55.0	2.68	2.14		2.57
60.0		0.00		
Surface Area	1565 cm²/gm	1415 cm²/gm	5350 cm²/gm	1832 cm²/gm

minerals causes an enlargement of all hydroseparators, classifiers and require in addition thickeners and high speed centrifugal classifiers.

(Continued on page 132)

Class 4: Flowsheet of Peace Valley plant, International Minerals & Chemical Corporation, mineral preparation: →

1 and 2. Punched-plate screens, 3/64 x 1-in. openings

3. Allen-Sherman-Hoff 10-in. D-frame, Hydro-Seal pump; 150 h. p. G. E. induction motor

4 and 5. Mudball Separator (Georgia Iron Works); 5 h. p. Allis-Chalmers motor and Falk Motoreducer

6 and 7. McLanahan-Stone single-roll crushers; V-belt, 15 h. p. Allis-Chalmers motor

8 and 9. Punched-plate screens, 3/64 x 1-in. slotted openings

8A. 4 x 12-ft. Allis-Chalmers horizontal vibrating screen, ⅜-in. square openings; V-belt, Allis-Chalmers 5 h. p. motor

10. 4 x 10½-ft. Robins horizontal vibrating screen, ⅜-in. square openings; V-belt, 7½ h. p. Allis-Chalmers motor

11. 6-in. G. I. W. top-discharge centrifugal pump, 50 h. p. G. E. induction motor

12 and 13. Duplex Dorr classifiers, 30-ft.; V-belt, 10 h. p. Allis-Chalmers motor

14 to 17. Double log, washer, corrugated cast-iron blades; 30 h. p. Allis-Chalmers motor and Falk Motoreducer

18 to 25. Tyler screens, 4 x 8-ft.; equipped with two "V-50" Hum-mer vibrators

26 and 27. Jeffrey vibrating pan conveyors, 10 x 1½-ft., operated from a motor-generator

28 to 30. Each is a 16-in. Republic belt elevator, 8 x 14-in. Link-Belt buckets, chain-driven from 10 h. p. Allis-Chalmers motor and Falk reducer. (No. 29 driven by 15 h. p. motor)

31. Screen, same as 8A; ½-in. sq. openings

32-34. Bins, each 100 tons

Class 4 flowsheet:

Flowsheet of Peace Valley phosphate plant, flotation section: →

1. 40-ft. Dorr hydroseparator; V-belt, 10 h. p. Allis-Chalmers Motoreducer

2. 75-ft. Dorr hydroseparator. Chain drives from 10 h. p. Louis-Allis motor and Falk Motoreducer

3. 8-in. Georgia Iron Works top-discharge centrifugal pump. V-belt, 75 h. p. G. E. induction motor

4. 4 x 12-ft. G. I. W. trommel, 3/16-in. screen openings. Chain-driven from 10 h. p. Allis-Chalmers motor and Falk Motoreducer

5. 8-in. G. I. W. top-discharge centrifugal pump, direct-connected to 150 h. p. G. E. motor

6. Six bins of 1,800 tons total capacity

7. Type FX Dorr quadruplex rake classifier; V-belt, 25 h. p. Louis-Allis motor and Falk Motoreducer. Two classifiers

8. 36-in. Republic belt conveyor, chain-driven from 25 h. p. Allis-Chalmers motor and Falk speed reducer. Two conveyors

9. Mixer. Two banks of four 60-in. agitating-type cells, each bank driven by two 25 h. p. Allis-Chalmers motors

10. Six banks of four 54-in. Type M. S. Air-Flow cells, each bank driven by two 15 h. p. Allis-Chalmers motors, with V-belts

11. 30-ft. Dorr thickener; 3 h. p. Louis-Allis motor and Falk reducer

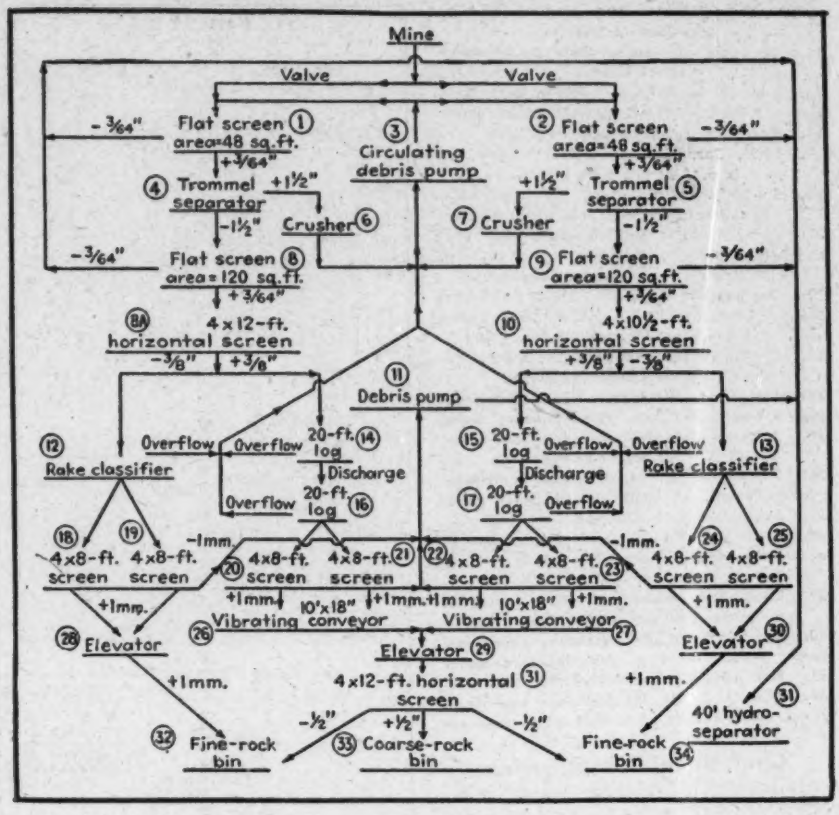
12. 6-in. G. I. W. top-discharge centrifugal pump; V-belt, 30 h. p. Allis-Chalmers motor

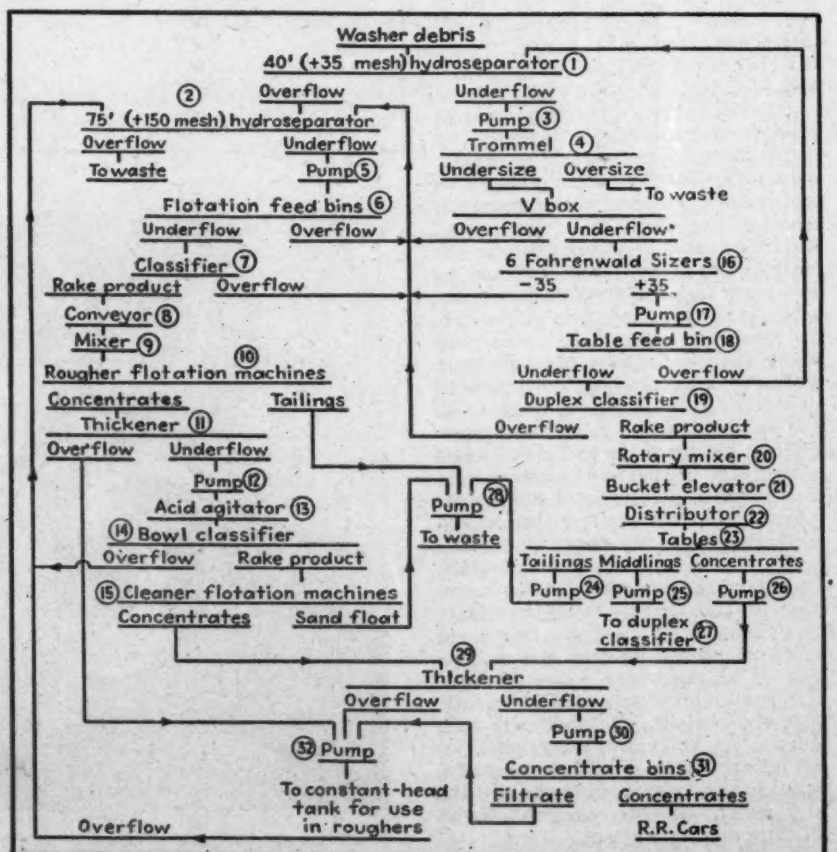
13. Agitator. One bank of four 60-in. agitator-type mixers; V-belt, two 25 h. p. Allis-Chalmers motors

14. 25-ft. Type FX quadruplex Dorr bowl classifier. Rakes driven by 25 h. p., and bowl by 7½ h. p. Louis-Allis motor with Falk reducer

15. Four banks of six 54-in. M. S. Air-Flow

(Continue caption of flowsheet page 132)





cells, each bank V-belt driven by three 15 h. p. Allis-Chalmers motors

14. Six banks of 6-pocket Dorr Co. Fahrenwald Sizers
17. 6-in. G. I. W. top-discharge centrifugal pump; V-belt, 40 h. p. Allis-Chalmers motor
18. Two bins, total capacity 450 tons
19. 30-ft. Dorr duplex classifier; V-belt, 10 h. p. Allis-Chalmers motor
20. 5 x 16-ft. rotary mixer; 15 h. p. Allis-Chalmers motor and Falk reducer
21. 24-in. Republic belt elevator, 10 x 18-in. Link-Belt buckets, chain-driven from 25 h. p. Allis-Chalmers motor and Falk reducer
22. One master distributor, three partitions, Deister Concentrator Co. Also three 5-partition secondary distributors
23. 15 No. 6 Diagonal-Deck Super-Duty tables. Deister Concentrator Co.
24. 4-in. G. I. W. top-discharge centrifugal pump; V-belt, 7½ h. p. Allis-Chalmers motor
25. A-frame Allen-Sherman Hydro-Seal pump; V-belt, 5 h. p. Westinghouse motor
26. 5-in. G. I. W. top-discharge centrifugal pump; V-belt, 10 h. p. Allis-Chalmers motor
27. Same as No. 19 classifier
28. 12-in. G. I. W., bottom-discharge centrifugal pump, direct-connected to 200 h. p. G. E. motor
29. 30-ft. Dorr thickener; 3 h. p. Louis-Allis motor and Falk Motoreducer
30. 6-in. G. I. W. top-discharge centrifugal pump; V-belt, 40 h. p. Allis-Chalmers motor
31. Five bins, total capacity 1,500 tons
32. 8-in. G. I. W. top-discharge centrifugal pump, direct-connected to 65 h. p. G. E. motor

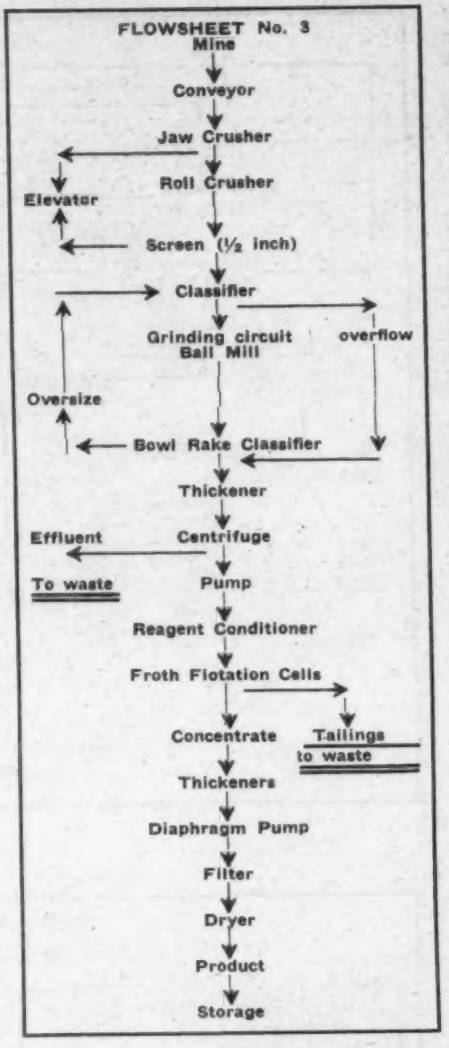
(Continued from page 131)

Centrifugal Classification

It has been fortunate for flotation operators who work with micron size particles rather than mesh size particles, that the solid bowl centrifugal classifier was developed to such a high degree of perfection by the ceramic and chemical industry.

It is very difficult to properly deslime or separate minerals in the —325-mesh range unless all minerals present are thoroughly peptized by deflocculating agents such as caustic soda, soda ash, the sodium phosphates and a few organic dispersants. In treating large tonnages of ore, chemical costs become prohibitive, especially when very large volumes of water are required for general preparation and transportation of the ore. To further complicate this situation, many operations must use reclaimed water or natural water loaded with dissolved salts which flocculate all the minerals until it becomes most difficult to effect an hydraulic separation. The centrifugal classifier does not require expensive deflocculants since the extreme acceleration and centrifugal forces thoroughly disperse all the micron size minerals. By referring to the Class III mineral particle size chart, it can be readily ascertained that a high degree of efficiency is attained in the separation at 7.5 microns.

The clay industry very successfully uses the centrifugal classifier to produce a paper coating clay which is all minus 1 micron. Other successful applications have been made in both the cement industry and the barite drilling mud operations.

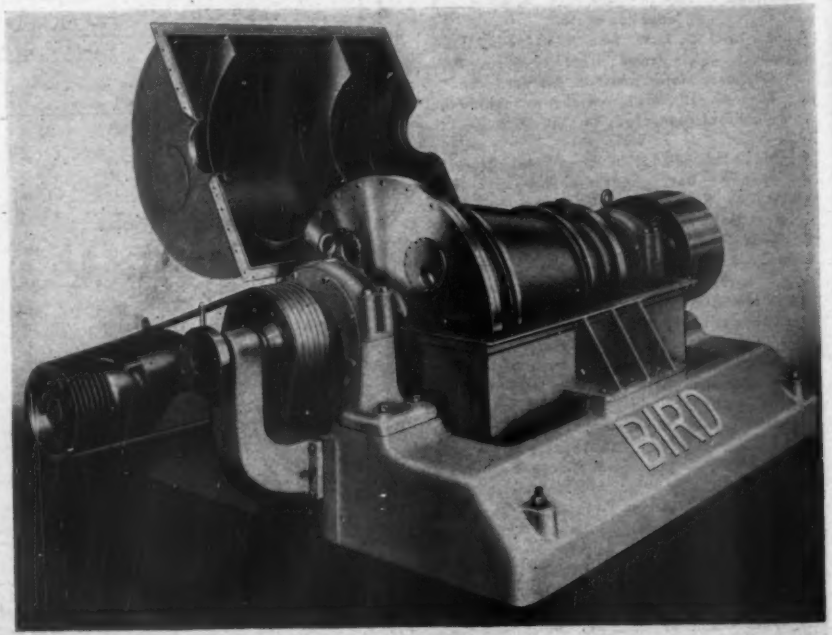


The particles in the Class IV range from 1½ in. to the submicron sizes. To further complicate the separation, hard clayballs and marl are ever present in marine or replacement deposits.

Class IV

For the purpose of showing a flowsheet representative of this Class IV, I have chosen the original flowsheet of the Peace Valley phosphate flotation plant, operated by the International Minerals and Chemical Corporation, Phosphate Division, Mulberry, Florida. From this flowsheet can be obtained information which can be readily adapted to practically all froth flotation mineral separation problems. Methods of materials handling and the units used are the result of careful research and costly operating experience extending back to the days in 1927 when my father, James A. Barr, chief engineer of International Minerals, outlined the first group of flotation testwork which produced such a tremendous impetus to the development of froth flotation processes for concentrating nonmetallic industrial mineral ores, and to the conservation of our irreplaceable mineral wealth by concentrating fine non-metallic mineral particles which for so long a time had been rejected as mill debris or waste.

Mechanical flowsheets for the nonmetallic minerals must be designed with the thought ever in mind that proper preparation of the minerals and mineral surfaces is the first consideration, if ease of operation in the froth flotation section and a high degree of mineral selectivity is to be accomplished.



Centrifuges are used very effectively in preparing a properly sized feed for the flotation system

Crane shown in the distant background, to the right, loads tram cars for haulage to sump to the rear of dredge which pumps material to main plant of Columbus Gravel Co., Columbus, Miss.

MISSISSIPPI—

Sand and gravel predominates as a construction aggregate

By H. E. SWANSON and NATHAN C. ROCKWOOD

IN MISSISSIPPI, as in the neighboring State of Louisiana, sand and gravel have no competition as construction aggregates due to the scarcity of stone. Alluvial deposits cover the entire State, which lies in the Coastal Plain, and aggregates are readily accessible and easily reclaimed. The high water table allows dredging operations since water rises to within a few feet of ground level.

Southern Mississippi forms a part of the main Gulf Coastal Plain of the southern United States, which extends northward beyond the State as the subordinate physiographic division—the Mississippi Embayment. The Gulf Coastal Plain, which also embraces the States adjoining Mississippi on the east and west, is in general an extensive lowland ranging in altitude from sea level to about 1000 feet above sea level, and in width from 130 to over 500 miles. Underlying the plain is a series of sedimentary formations ranging in age from Cretaceous to Recent, and increasing in thickness from a feather edge along the inner border of the plain to about 30,000 feet at the coast in the vicinity of the mouth of the Mississippi River.

The Mississippi Embayment is a broad arm of the Gulf Coastal Plain extending from the main plain up the valley of the Mississippi River to the southern extremity of Illinois. It is bordered on the west, north, and east by outcropping sedimentary rocks of Paleozoic age.

Geologic Structure

The oldest geologic formation known to outcrop in the State is the Devonian of the Paleozoic System, occurring in the extreme northeast corner of Tishomingo County. Overlying the Devonian, in the same region, is the Mississippian or Lower Carboniferous, exposed chiefly along the stream channels of Tishomingo county.

The Tuscaloosa formation of the Cretaceous system lies on the Carboniferous, and occurs at the surface over a large part of the Tennessee River Hills. Materials of the Tuscaloosa consist of clays and lignites in the lower part and unconsolidated sands and gravels in the upper part. Overlying the Tuscaloosa are the Eutaw sands, outcropping in the western part of the Tennessee River Hills and extending to the Tombigbee River.

Selma chalk, a soft limestone, rests on the Eutaw sands, and is several hundred feet in thickness. The outcrop constitutes the Black Prairie Belt of northeast Mississippi.

The Ripley formation, uppermost group of the Cretaceous,, outcrops along the western border of the Black Prairies from the Tennessee line to the town of Houston in Chickasaw county, where it disappears beneath younger formations. Material of the Ripley consists of beds of sandstone and sandy limestone toward the base of the formation, above which lie highly fossiliferous, micaceous marls.

There are seven divisions of the Tertiary Formation. First is the Midway, the lowest member consisting of hard limestone. Above it is a variable thickness of micaceous yellowish sand. The chief member of the Midway is the Porters Creek clay, a tough gray clay which overlies the lowest member just described. The second division of the Tertiary is the Wilcox, the thickest of the Tertiary forma-

At the Southern Sand & Gravel Co., Amory, Miss., 12-cu. yd. dump cars unload material into a sump, where it is picked up by an 8-in. pump and sent to the plant

tions of Mississippi, ranging from 900 to 1000 ft. Materials are alternating beds of sand, clays, and lignite. The region is one of mature erosion. The original surface was that of a gently rolling plateau of 500 to 600 ft. elevation, but has been cut up into a region of ridges and rough topography. Next to the Wilcox is the Claiborne, the lower portion of which is decidedly sandy, passing upward into a hard quartzitic rock called buhrstone. The upper division consists of calcareous sands and clays.

The Jackson division of the Tertiary overlies the Claiborne, and is a series of calcareous clays and marls, extending across the State in an almost east and west direction, giving rise to the topographic unit known as the Jackson Prairie Belt. The Vicksburg, a narrow band of alternating limestone and marls, outcrops in ledges on the southern border of the Jackson, and forms the southern and more elevated margin of the Jackson Prairies. South of this region is an extensive region embracing practically the whole southern half of the State. The soil is sandy or loamy and the region is maturely eroded. This region is underlaid by the Grand Gulf Complex, subdivided into several formations. The northernmost division is the Catahoula consisting of several hundred feet of gray sandstone and lignitic clays. South of this region is the Hattiesburg clay outcrop. A limited outcrop along streams in southeast Mississippi of fossiliferous marine marls and clays constitute the Pascagoula formation, which does not occupy important areas at the surface.

The final division of the Tertiary is the Citronelle, covering much of the southern half of the State, and overlapping several of the older formations. Materials are tawny and red sands with an admixture of clay. Associated with these sands are extensive deposits of chert gravel which constitutes a valuable road material.

The Quaternary formations in Mississippi consist of the Loess, Brown Loam, and Recent Alluvium, consisting of calcareous silt, loam, and sand and gravel, more or less mixed.

Sand and Gravel

The principal sand bearing formations of Mississippi are the Tuscaloosa, Eutaw, and Ripley of the Cretaceous, the Wilcox and Tallahatta Buhrstone of the Eocene, the Grand Gulf and Citronelle of the later Tertiary, and terrace formations of the Pleistocene. The widespread distribution of sandy coastal plain formations, and their extensive erosion and redeposition as sands along stream channels, have made sands for various structural purposes easily accessible in most parts of the State.

Occurring in two main areas in the State is a chert gravel, consisting of subangular or water-worn fragments of chert or impure flint, embedded in a matrix of clay or clayey sand. One area follows the bluffs of the Mississippi River, spreading eastward across the State in the southern counties, and the other, much less extensive, lies adjacent to the Tennessee River and on the Tennessee-Tombigbee divide. The gravel of the western area is reddish-brown in color and of uniform size, averaging about 1 to 1½ in. in diameter. Gravel in the northeastern area is yellowish-white and most of it contains large masses of chert.

In the lower Carboniferous beds of Tishomingo County are extensive deposits of chert interbedded with limestone. These chert deposits outcrop in high hills near the Tennessee River, and are of great thickness, from 50 to 75 ft., and are an excellent road material.

Limestone

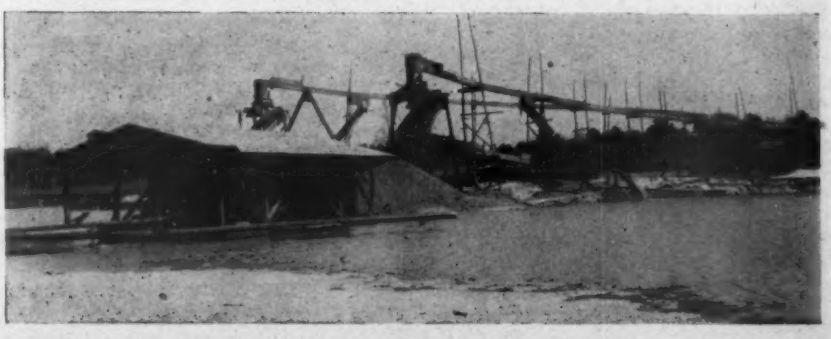
Mississippi has considerable quantities of limestone, but only a comparatively small tonnage is quarried as a construction material or as agricultural stone. Production of agricultural limestone, however, is increasing. Limestone is obtainable from the Devonian and the sub-Carboniferous formations which outcrop in Tishomingo County, as well as from the Selma, Ripley, Clayton, and Vicksburg formations in lesser quantities.

The Devonian formation, consisting of shales and limestones, outcrops along Yellow Creek in Tishomingo County. The limestones attain a thickness of 40 ft. or more and consist of layers of dark, compact rock. The Sub-Carboniferous formation which overlies the Devonian, contains beds of limestone, gray in color, and consisting of compact layers attaining a thickness of 10 ft. or more.

The Selma chalk contains hard layers of limestone, with some crinoidal layers, composed of cemented fragments of crinoid stems. The Ripley formation consists chiefly of marls, but contains some layers of fossiliferous limestone. It occupies a very narrow belt of outcrop, extending along the western border of the Selma chalk from Houston to beyond the Tennessee line.

The lowermost member of the Eocene series of rocks is the Midway, consisting of two formations, the Clayton and the Porters Creek. The Clayton is a marine formation, consisting of fossiliferous limestones and sandstones. The Porters Creek outcrop extends along the western border of the Cretaceous outcrop.

The outcrop of the Vicksburg limestone extends across the State from Vicksburg to Waynesboro, and the continuity of outcrop is broken by the overlapping of younger formations and by the erosion of streams. The stone is a soft, chalk-like rock of white or buff color, while in some exposures, the formation consists of layers of moderately hard blue limestone.



Dredge pump at Green Bros. plant, Georgetown, Miss., picks up sand and gravel from stockpiles built up by relay stations in pond. Note two trash collectors at tops of relay stations

HIGHWAY SPECIFICATIONS

MISSISSIPPI is primarily a sand and gravel State, therefore the State, highway specifications contain no mention of crushed stone as a coarse aggregate. Although geology shows that there is limestone in the State, few commercial plants are in existence to market the product. As in the neighboring State of Louisiana, the sand and gravel deposits contain some impurities, therefore rigid specifications have been set up requiring a clean product. These are discussed later in this article.

Cement

Specifications for portland cement call for a specific surface area as determined by the turbidimeter of not less than 1600 sq. cm. per gram. For high early strength cement the surface area shall not be less than 1900 sq. cm. per gram. Portland cement must meet the following chemical requirements:

Loss on ignition, percent	4.00
Insoluble residue, percent	0.85
Sulphuric Anhydride (SO_3), percent	2.00
Magnesia (MgO), percent	5.00

Chemical property requirements for high early strength cement are identical except that the percent of SO_3 is 2.50 instead of 2.00.

Sampling and testing shall be in accordance with A.A.S.H.O. Standard Methods T-1-38 and T-98-38, for both normal and high early strength portland cement. In addition to the usual soundness test for cement, requiring that a pat of neat cement shall remain firm and hard and show no signs of distortion, cracking, checking, or disintegration in the steam bath, Mississippi requires that a bar of neat cement shall remain firm, hard, and undistorted, and shall not increase in length more than 0.5 percent when tested in accordance with the Autoclave Expansion Test.

The average tensile strength in pounds per sq. in. of not less than three standard mortar briquettes composed of one part of cement and three parts of standard sand, by weight, shall be equal to or higher than the following:

Standard portland cement:

Age at Test—Days	Storage of Briquettes	Tensile strength Pounds per sq. in.
7	1 day in moist air, 6 days in water	275
28	1 day in moist air, 27 days in water	350

The average tensile strength of standard mortar at 28 days shall be higher than the strength at 7 days.

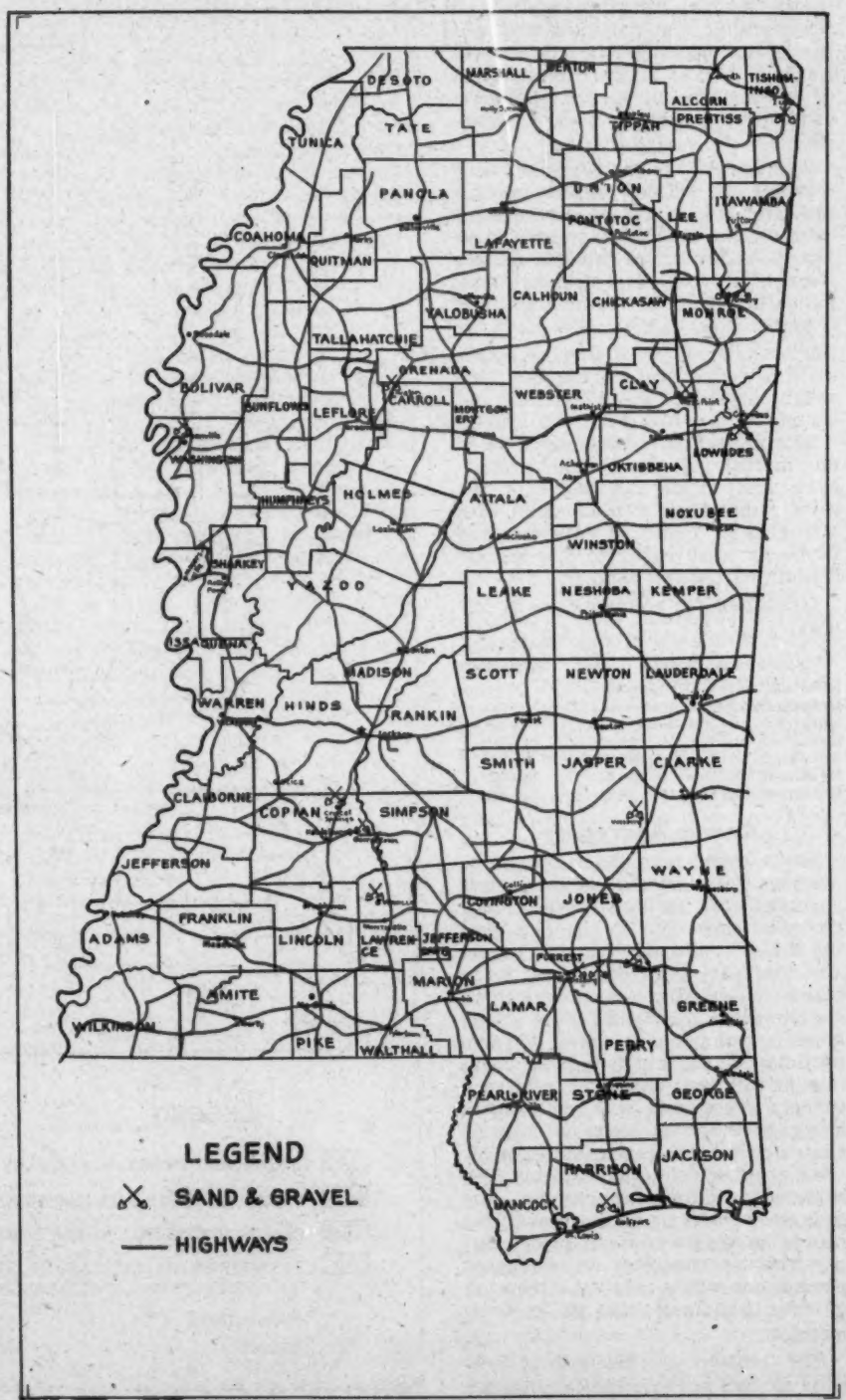
High early strength cement:

Age at Test—Days	Storage of Briquettes	Tensile Strength Pounds per sq. in.
1	1 day in moist air	275
3	1 day in moist air, 2 days in water	375

If, at the option of the Department, a 28 day test (with storage of one day in moist air and 27 days in water) is required, the average tensile strength obtained at 28 days shall be higher than the strength obtained at three days.

Fine Aggregate

Clean, hard, durable natural sand is specified for highways as a fine aggregate for portland cement concrete, containing particles free from deleterious substances. Fine aggregate used in bridge concrete for super structure requires that no coal or lignite be permitted. The deleterious substances shall not exceed the following:



Map of Mississippi with sand and gravel deposits indicated and highways in color

Deleterious Substances	Maximum Permissible Percentage By Weight
Removed by decantation.....	1.0
Coal, lignite, or combination of the two	0.5
Clay lumps	0.25
Others, such as shale, alkali, mica, coated grains, or soft and flaky particles.....	2.0
Total shale, coal, lignite, clay lumps, and others.....	3.0

Percentage of clay lumps is determined by examination of the various fractions which remain after the test for grading. Any particles that can be broken up with the fingers are classified as clay lumps. The diameter of deleterious substances shall not exceed the maximum size of aggregate.

Aggregates are subjected to the colorimetric test for organic impurities, and any aggregate producing a color darker than the standard is rejected, unless it passes the mortar strength or concrete strength tests indicating it to be suitable for use.

When subjected to five cycles of the soundness test of fine aggregate by the use of sodium sulphate, the weighted percentage of loss shall not be more than 10 percent by weight.

The mortar strength test is based on mortar of the same proportions and consistency made of the same cement and Ottawa sand, with strengths at 7 and 28 days required to be at least equal to the mortar containing Ottawa sand.

Gradation requirements are as follows:

Square mesh sieves	Percentage by weight
Retained on ⅜-in. sieve.....	0
Retained on No. 4 sieve.....	0-5
Retained on No. 8 sieve.....	0-20
Retained on No. 16 sieve.....	10-50
Retained on No. 30 sieve.....	30-70
Retained on No. 50 sieve.....	70-97
Retained on No. 100 sieve....	95-100

Coarse Aggregate

No provision is made in the specifications for crushed stone as a coarse aggregate for portland cement concrete, probably due to the fact that the State is well endowed with gravel and there are few commercial stone plants in the State, although there are limestone deposits. The gravel must be composed of hard, durable particles, clean, and free from coatings of injurious character, and reasonably free from soft or disintegrated pieces or an excess of thin or elongated pieces, frozen lumps, vegetable or other deleterious matter. The same restrictions concerning the presence of coal or lignite prevail for coarse aggregate used in bridge superstructure concrete. An elongated piece is one whose greatest dimension is more than four times its least dimension.

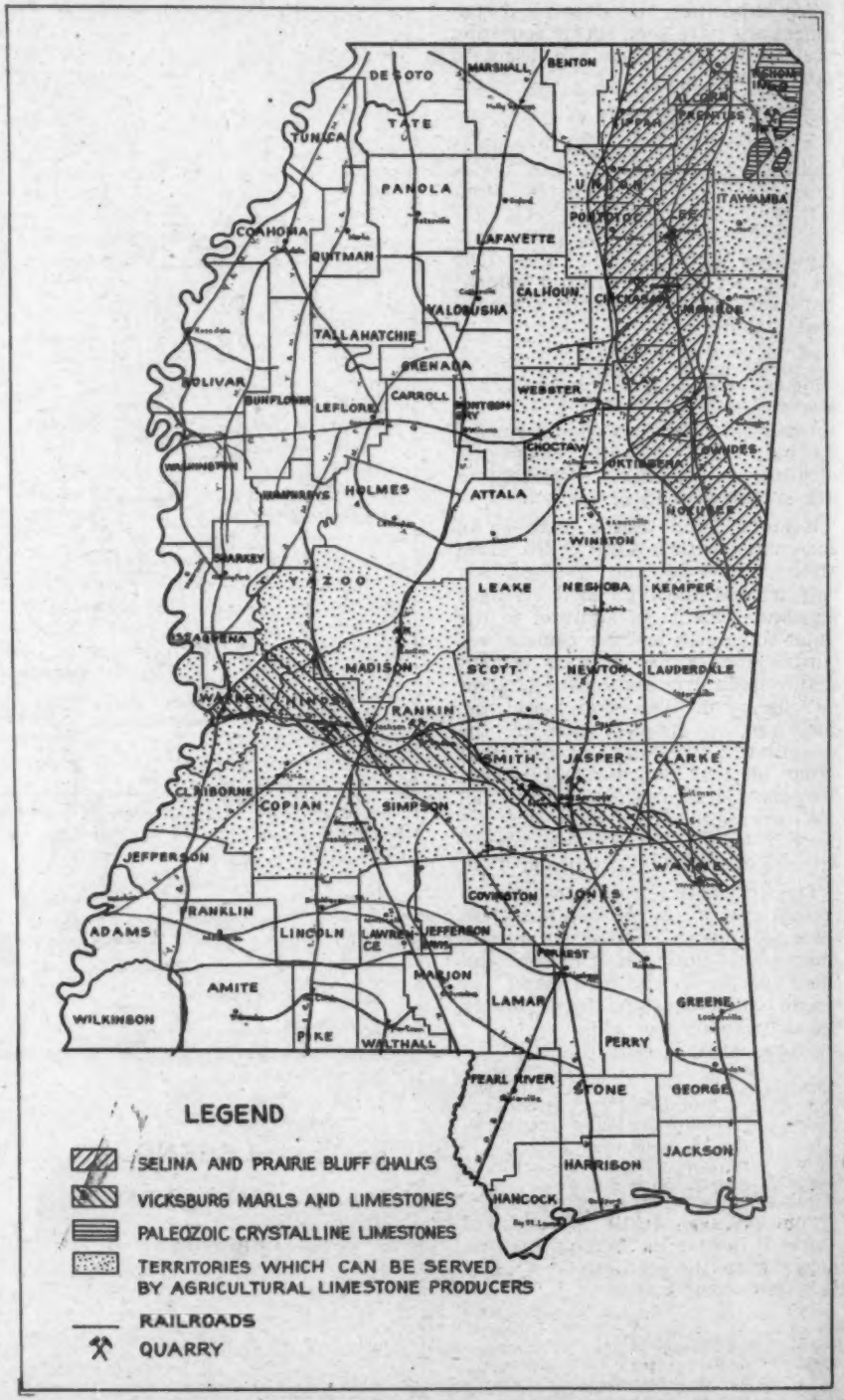
The amount of deleterious substances shall not exceed the following maximum requirements:

Deleterious Substances	Maximum Permissible Percentage By Weight
Removed by decantation.....	1.00
Shale	1.00
Coal, lignite, or combination of the two	0.50
Clay lumps	0.25
Soft fragments	3.00
Free shells	1.00
Sticks (Oven dry)	0.025
Total shale, coal, lignite, clay lumps, and soft fragments..	3.0
Other deleterious substances.	1.0

The diameter of any deleterious substance shall not exceed the maximum size of aggregate.

The percentage of wear, when subjected to the Los Angeles Rattler Test for 500 revolutions, shall not be more than 28. When subjected to five cycles of the sodium sulphate test the weighted percentage of loss shall not be more than ten percent by weight.

Gradation requirements for coarse aggregate are shown in table, next page.



Map of Mississippi showing stone deposits, location of quarries, and railroad lines in color

Two dredge pumps feed large gravity screen for production of one size of gravel and two of sand at Richton Investment Co. plant, Richton, Miss. Cars are loaded directly from screens

Square mesh sieves	Percentage by Weight Serial Designation G-1	G-5
Retained on 2½-in. sieve	0	
Retained on 2-in. sieve..	0-3	
Retained on 1½-in. sieve.	0-5	0
Retained on 1-in. sieve...	5-30	0-15
Retained on ¾-in. sieve.	40-60	
Retained on ½-in. sieve.		45-70
Retained on ⅜-in. sieve.		
Retained on No. 4 sieve..	95-100	94-100
Retained on No. 16 sieve.	99	99

For the purpose of determining the degree of uniformity, a fineness modulus determination shall be made upon representative samples submitted by the contractor from such source as he proposes to use. Coarse or fine aggregate having a variation in fineness modulus greater than 0.20 either way from the fineness modulus of the representative sample may be rejected, or may be accepted subject to changes in the proportions used as the engineer may direct.

PLANT PRACTICES

SAND and gravel predominate as construction aggregates in Mississippi. Although there are limestone deposits they have not been worked to any degree. The majority of the sand and gravel operations are comparatively simple and economical, featuring pumping and sizing over gravity screens. Surface water rises to within a few feet of the ground so that dredges may be floated in pit operations. Many producers rehandle material by dredge to remove clay and other objectionable matter, as well as to provide a greater amount of solids through the suction line to the plant.

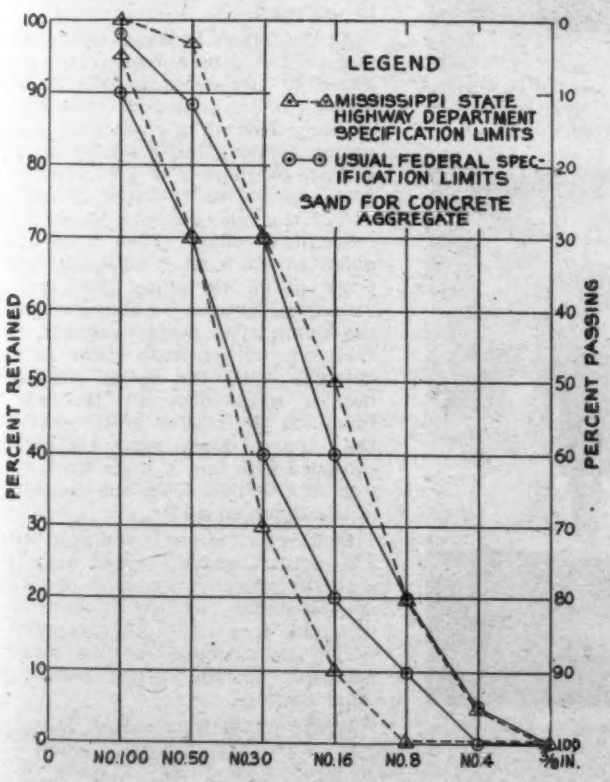
The Forrest County Gravel Co. at Hattiesburg pumps from an 80-ft. stratum, all but 15 ft. covered by water. Flexibility of operation permits rehandling when in a dirty deposit or single handling when clean aggregates are pumped. Feed to gravity screens is from a 10-in. Amsco pump operating at about 50 percent solids. Gravel sized on the screens is sent directly to railroad cars or returned to the pond when extra washing is needed. This pond stockpile is reclaimed by an 8-in. Amsco pump and sent to the gravity screens, then to cars. A grizzly with 2-in. spacings has been placed in advance of the screens to scalp off clay balls, which are then laundered to waste.

Sand is reclaimed in boxes with specified screen cloth above the box to catch the desired size. When sand is not produced, a plate is placed over the box and the sand is laundered to the pond. When only sand is desired, it is reclaimed from this stockpile by a 5-in. pump which pumps it to another plant adjacent to the main plant. Here two sizes of sand are made in two sand boxes. Discharge from the boxes is to cars or to trucks. Capacity is about 20 cars of gravel and 10 cars of sand per day.

Bucket Elevator Reduces Pump Load

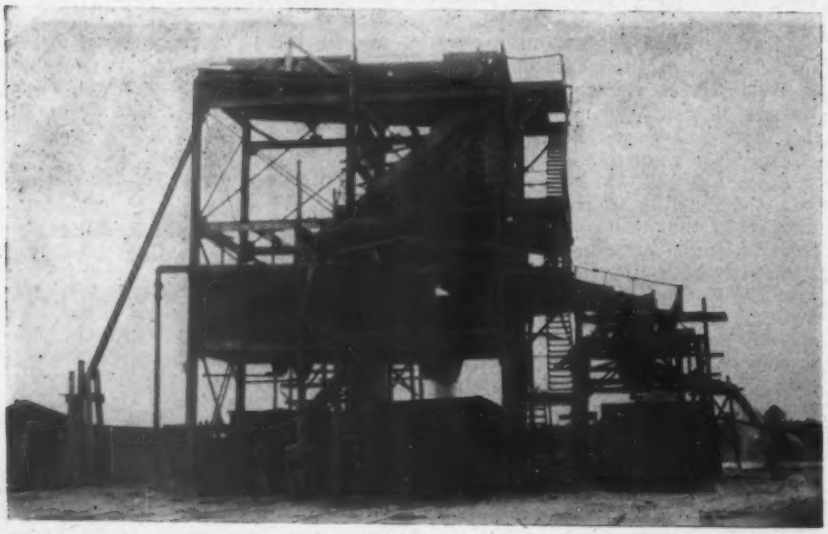
To allow the dredge pump to operate against a smaller head, the American Sand and Gravel Co., Hattiesburg, has installed a bucket elevator to raise gravel above the gravity screens to final sizing on vibrating screens. Greater production is possible since a greater amount of solids can be sent through the suction pipe when operating at the lower head. Pumping from an 80-ft. deposit, a 10-in. Morris pump raises the pulp 40 ft. to an 11½- x 15-ft. gravity screen with ⅜-in. openings on the upper 5 ft. and ¼-in. openings on the lower 6½ ft. of the screen. To assist in moving a greater percentage of solids through the pipe, the 60-ft. suction line on the dredge has been equipped with a 45 deg. "L" having a 5-ft. Bell nozzle. A 4-in. fitting in the "L" has been reduced to 2 in., and water at 555 g.p.m. is sent through the nozzle by a 4-in. Fairbanks-Morse pump. The "L" on the lower end of the suction pipe not only acts as a booster to send more solids through the pipe, but also assists in providing a steadier load and helps to prevent overload.

Gravel retained on the gravity screen drops into a 1½-cu. yd. surge hopper with manually-controlled feed to the bucket elevator. When only sand is produced, or when the deposit is too dirty to process, feed from the hopper is through a 10-in. pipe back in the pond, where it is cleansed by the rehandling. Gravel to be processed is carried by the 20-in. belt bucket elevator, 19-ft. centers, to a surge box placed above a triple-deck 4- x 10-ft. Tyrock screen. Feed from

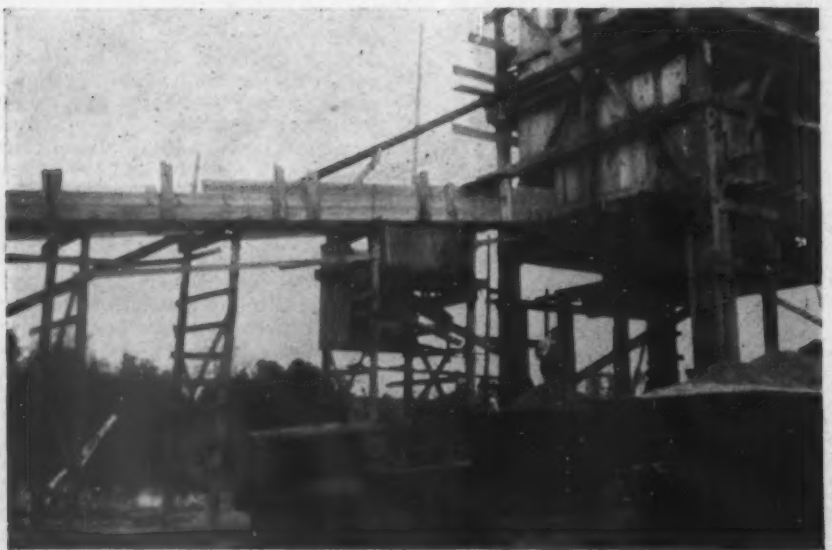


Mississippi State Highway Department specification limits compared with Federal specifications for sand

Sand separation at American Sand & Gravel Co., Hattiesburg, Miss., to the right. Gravel passes to a vibrating screen in the center. Pipe projecting out to the left loads truck bin



At Columbus Gravel Co., the pulp is pumped through pipe at left to a spreading table at top of plant. Gravity screens below spreading table size the gravel which drops into bins for car loading. Sand is recovered in box under launder at right



Sand is reclaimed in a box under a flume at the plant of Forrest County Gravel Co., Hattiesburg, Miss. Note two discharge pipes from sand box

the surge box is opposed to the angle of the screen to give greater screening efficiency. Screen openings on the three decks are ¾-, ⅜- and 5/32- x ⅜-in., respectively. Three gravel sizes can be produced and sent directly to railroad cars on three tracks, or by a series of baffles, the product from any deck can be combined with that of another screen deck. Adjacent to the plant is a truck loading bin. As this bin is only slightly below the level of the discharge end of the screens, a 10-in. pipe has been placed at only a slight degree from the horizontal between the bin and a surge box under the screens. To assist in movement of gravel through the pipe, water from a 5-in. pump is sent through a 3-in. pipe into the feed end of the delivery pipe. The lubricating action of the water flushes the gravel through the 10-in. pipe and helps to load the truck bin.

Fine Sand Recovery

Sand passing the gravity screen drops into a 4- x 8- x 15-ft. sand box, with three 5-in. openings in the bottom, controlled by cone type valves. It is discharged into cars as concrete sand. In the launder which carries overflow from the larger sand box are two smaller sand boxes for recovery of masons' sand. Above the first box is a 4-mesh screen and above the second box, a little farther down the launder, it has a ⅛-in. screen. The first box, equipped with two cone type valve discharge gates, sends fine sand to cars, while the second box, with a single discharge gate, sends fines to trucks. Overflow goes back to the pond.

At the Green Brothers Gravel Co., Georgetown, sand and gravel are produced in two separate plants. The deposit is rehandled at twin relay stations, feed to the stations alternating as stockpiles are built up. An average overburden of 4 ft. is carried with the 14- to 16-ft. of gravel to one of the relay stations by an 8-in. centrifugal pump. Feed from the pump is into a trash collector, composed of an old pump shell and a cylindrical chimney. Solids sent into the pump shell revolve around the shell, the lighter trash rising in the chimney with the water and the heavier solids dropping through a funnel at the bottom of the shell to the screens. Each relay station is equipped with one of these trash collectors. Overflow from the collectors is laundered to waste.

Each relay station is equipped with a 6- x 10-ft. gravity screen with ⅜- x 1¼-in. openings. Oversize drops to one stockpile in the pond, and throughs drop to another stockpile. When the stockpiles at one station are built up, the dredge feeds the other station.

When gravel is produced, a 10-in.

(Continued on page 140)

Sly Dust Filters—heart of the Complete Sly Dust Control System—at Oliver United Filters, Inc., Hazelton, Pa.

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Dredging operation of Amory Sand & Gravel Co., which has a 15-ft. bed of gravel with 4 ft. of overburden pumped to the plant by an 8-in. pump

Mississippi Plant Practices

(Continued from page 138)

centrifugal pump picks up the gravel from the stockpile and sends it to top of the loading plant, where it passes over a spreading table to a 4- x 8-ft. double-deck Universal vibrating screen, with 1½- and ⅜-in. openings on the upper and lower decks, respectively. Oversize, averaging less than 2 percent of the total feed, drops to the ground where it is picked up and stockpiled by a crane. Retained on the lower deck, concrete gravel, is sent directly to railroad cars, and throughs are laundered back to the pond.

When sand is produced, it is picked up from the stockpile by the same pump and sent to the sand plant adjacent to the gravel plant. Discharge is over a 6- x 10-ft. gravity screen with ⅜-in. openings on one-third of the screen and ¼-in. openings on the remaining two-thirds. It has been found by experience that this arrangement produces a concrete sand that passes State Highway specifications. Oversize from the gravity screen is laundered back to the pond, while throughs drop into a 15-cu. yd. settling tank. Four manually-controlled openings at the bottom of the tank allow feed to cars.

Present capacity is about 25 cars in eight hours. The plant will be replaced by an all-steel structure of similar design in the near future, with a triple-deck screen replacing the double-deck screen in the gravel plant.

Typical of many of the operations, featuring simplicity of operation as well as economy, is the plant of the Fleming Gravel Co. at Columbus. A 40-ft. deposit with a 4-ft. sandy overburden is pumped by a 10-in. counterflow pump to a 12- x 16-ft. gravity screen. Openings in the screen are determined by the type of gravel to be produced. Oversize drops into a 30-cu. yd. bin, with bottom discharge for car loading and side discharge for truck loading. Under the gravel screen is another 12- x 16-ft. gravity screen with 4-mesh openings. Oversize from this screen also joins the gravel in the bin. Throughs are laundered through a flume containing two sand boxes of about 3-cu. yd. capacity, for recovering concrete and masons' sand. Discharge from the sand boxes is to stockpiles immediately below. Sand is loaded for shipment by a ¾-cu. yd. Northwest crane. Capacity of this plant is rated at 50 cars per day.

Richton Investment Co., Richton, Miss., in the southeast part of the State, has a typical gravity screening operation, with two dredge pumps feeding a large screen. Gravel is sent

(Continued on page 142)

Material pumped to the feed box at the top of the Southern Sand & Gravel Co. plant passes over gravity screens for sand separation, oversize going to a double-deck vibrating screen and sand to steel settling tank at right

PUSH BUTTON CONTROL FOR A GIANT

Easy control, always an important feature of Ransome design, is carried a step further in the latest models 56S, 84S, and 126S Blue Brute "Big" Mixers. A new 4-way solenoid valve has been added for improved remote control of the discharge chute, considerably simplifying operation. Merely pressing a button gives operator instant control over chute — allowing faster, more accurate discharge into truck mixers, hoist buckets or hoppers.

OTHER IMPROVEMENTS INCLUDE:

Drum rollers turning independently on two Timken roller bearings . . . Extra-heavy roller shafts of heat-treated alloy steel, adjustable to allow for wear and to keep the drum always properly centered . . . Countershaft mounted on self-aligning bearings . . . Drum roller tracks machined to a true circle, for smoother operation and longer service life . . . Enclosed V-belt drive, with helical gears running in an oil bath . . . Ransome's exclusive mixing action for fast, thorough mixing.

These are a few of the reasons why Ransome Blue Brute "Big" Mixers are first choice for low-cost, trouble-free performance in central mixing plants and on so many big construction jobs. Your nearby Worthington-Ransome Distributor has the whole story. Call him and he'll be glad to give you additional proof that *there's more worth in Worthington-Ransome.*

RS-15

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute Mixers and other construction equipment can put your planning on a profitable basis. His name is listed on Page 140. Blue Brutes include:

RANSOME EQUIPMENT

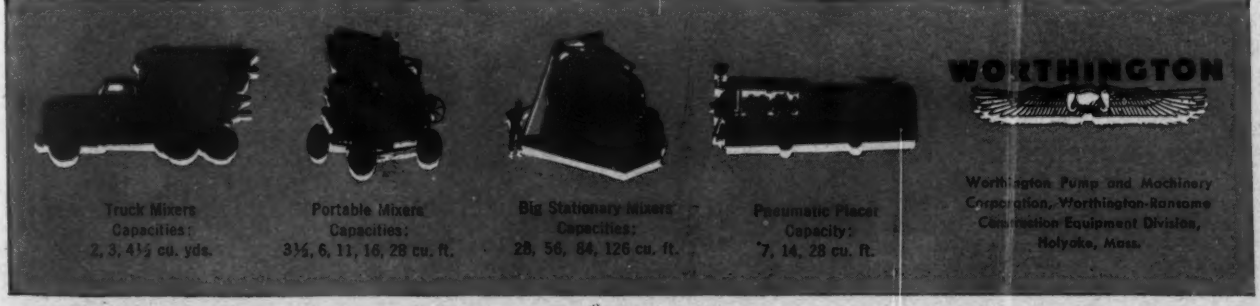
Pavers, Concrete Spreaders and Finishers*, Portable and Stationary Mixers, Pneumatic Placing Equipment, Truck Mixers, Plaster & Bituminous Mixers and Accessories.

WORTHINGTON EQUIPMENT

Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Contractors' Pumps* and Accessories.

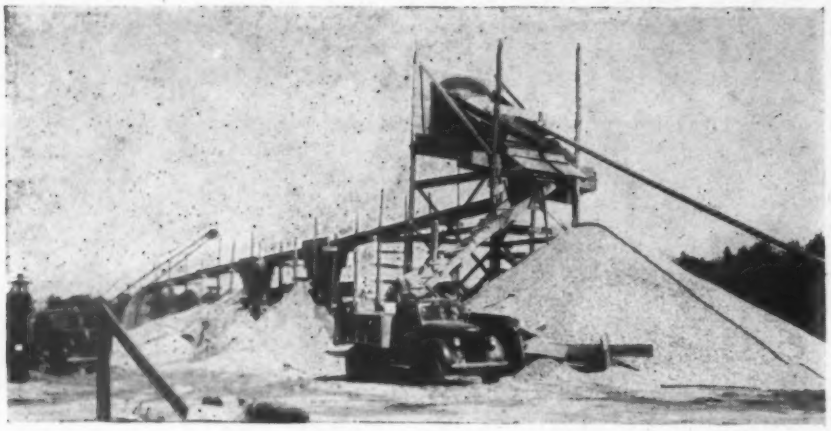
*To be announced.

BUY BLUE BRUTES



WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.



Operations at Amory Sand & Gravel Co., Amory, Miss., where oversize from gravity screen is stockpiled for road gravel; all under 1½-in. Sand is recovered in boxes in launder. Chute at discharge end of screen is used for direct truck loading

Operating Trends

(Continued from page 140)

directly to cars and sand is recovered in sand baxes under the launder. Capacity is about 30 cars of gravel and 20 of sand per day.

At the Columbus Gravel Co., Columbus, Miss., overburden is stripped and the underlying gravel is picked up by dragline, loaded to tram cars, and carried to a sump at the plant where it is rehandled and sent to the plant by pump. About 75 acres is available for working, but the deposit is located at some distance from the plant, so that direct pumping is not feasible. The deposit is worked in 55-ft. strips, 1200 ft. long, and overburden is thrown into the previously worked area. When a strip is completed, the railroad tracks are moved, and another 55-ft. strip is started. Overburden, averaging about 4 ft. is stripped with a Northwest dragline with a 1-cu. yd. Page bucket. The 12-ft. stratum of gravel is reclaimed by a P. & H. dragline with a ¾-cu. yd. bucket and loaded into 12-cu. yd. Austin-Western sidedump cars. Five to six of these cars are moved at one time over standard-gauge track by a 45-ton Vulcan locomotive. The cars discharge into a 20-car capacity sump where the gravel receives preliminary cleansing. Here it is picked up by a 10-in. Amsco counterflow pump and sent over a spreader table at the top of the plant. From the table, discharge is to a pair of gravity screens, 10- x 13-ft., one above the other. Oversize drops into a 40-cu. yd. capacity bin with manually-controlled gates for car loading, gravel retained on the lower screen (pea gravel), drops to cars directly, and throughs go into a 30-cu. yd. capacity sand box. Overflow from the sand box launders to waste. Capacity of the plant is about 1000 tons per day.

Starting production in April, 1945, the West Point Gravel Co., West Point, Miss., is a dredging operation, and gravel is sized by gravity screens. The 6-ft. overburden of sandy loam is not stripped, but is washed down with the underlying 20-ft. stratum of gravel. Material in the deposit is pumped by a 6-in. Hetherington and Berner pump over two 6- x 15-ft. gravity screens. Oversize drops into a bin as concrete aggregate, that retained on the lower deck goes into a pea gravel bin, and throughs drop into a sand box. Overflow is laundered to waste. Capacity is about 350 cu. yd. per day.

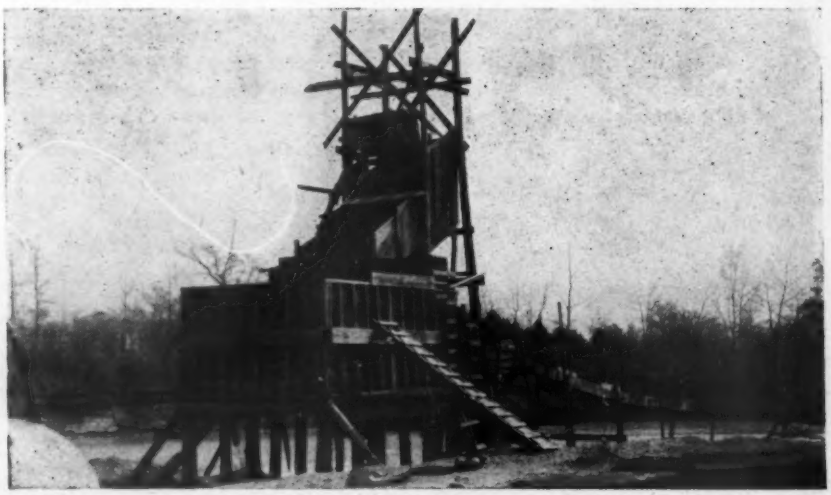
Southern Sand and Gravel Co., Columbus, strips a 5-ft. overburden and reclaims the 15-ft. layer of gravel with a class 14 Bucyrus-Erie dragline having a 2½-cu. yd. Page bucket. The dragline loads 12-cu. yd. Austin-Western side-dump cars which are moved over standard-gauge track by a Vulcan locomotive to a sump at the plant.

From the sump, gravel is picked up by an 8-in. Amsco pump and sent to a spreading table at the top of the plant. Preliminary sizing is made on a 7- x 8-ft. gravity screen with ¼-in. openings, oversize going to a 4- x 7-ft. double-deck vibrating screen with ⅜- and ⅛-in. openings on the two decks. Concrete aggregate, oversize, drops into a 40-cu. yd. bin while the gravel retained on the lower deck (pea gravel) goes directly to cars. Throughs from the vibrating screen join the throughs from the gravity screen and drop into a 3-cu. yd. steel sand box, overflow laundering to waste. When masons' sand is produced, a screen mesh is placed over the sand box to reclaim the fines.

At Amory, Miss., the Amory Sand and Gravel Co. has a typical plant featuring pump recovery of gravel with gravity screens for sizing and sand separation. This plant has two operations, one for car loading and the other for truck loading. Both plants are similar and are also the same as the other gravity screen plants described herein.

The Amory Concrete Gravel Co., Amory, has recently built a new plant to handle truck sales. A 6-in. Morris pump sends gravel to a 6- x 10-ft. gravity screen. Oversize drops to a stockpile as concrete aggregate and throughs go to two sand boxes for concrete and masons' sand.

On the Southern Sand & Gravel Co. dredge, a 100 h.p. electric motor drives an 8-in. pump through a V-belt. The material is pumped from a sump against a 60-ft. head to the plant



Material pumped to the West Point Gravel Co. plant is sized over two gravity screens with sand recovered in boxes under launder

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Maximum protection provided by HAMMOND Bags means that your product reaches the ultimate consumer in best possible condition. HAMMOND Multi-Wall Bags are noted for their added *product-protection . . . rich, attractive, colorful labels* that impressively identify *your* product . . . *low cost . . . easy handling* . . . and *ability to withstand rough handling in any kind of weather.* JUST ASK THE HAMMOND MAN!

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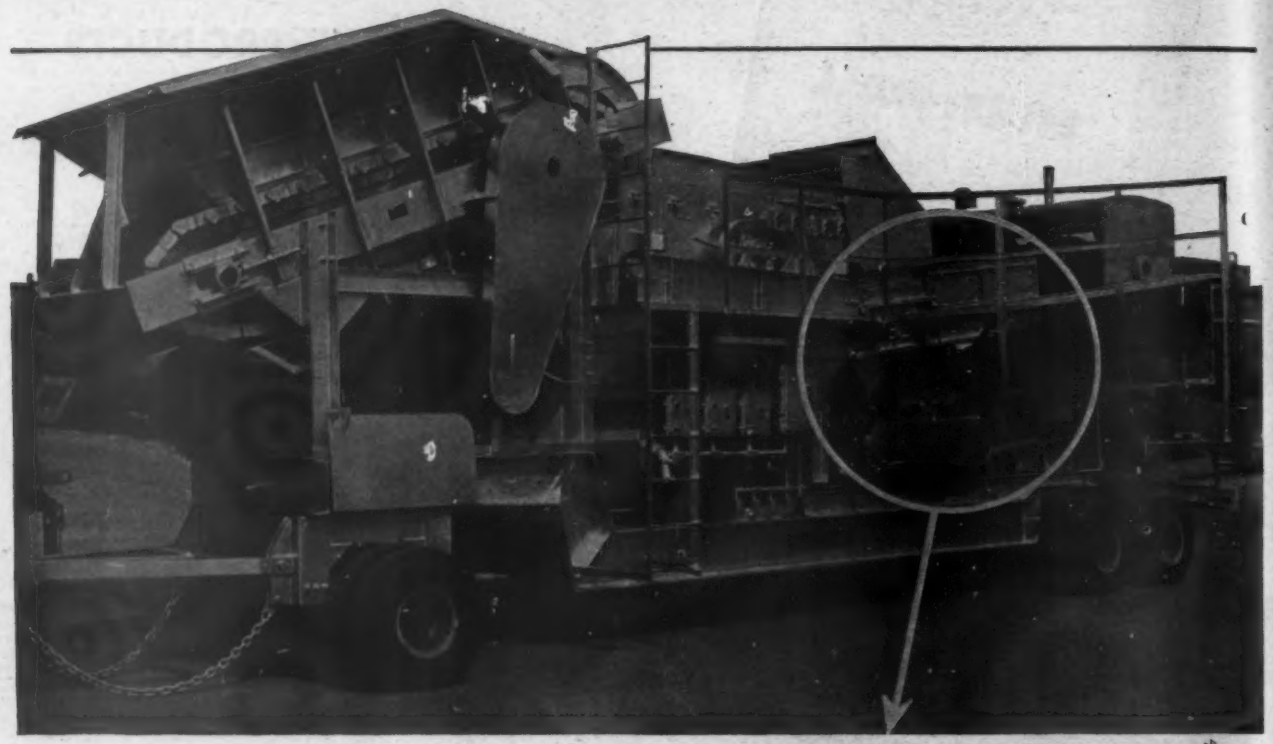
Dixie portable crushing plant...

GOES ANYWHERE



Crushes 100 to 150 tons per hour

40 to 60% agstone—Reaching and supplying crushing markets anywhere... at any time... this revolutionary new DIXIE PORTABLE CRUSHING PLANT reduces quarry-run stock to minus 1 inch or to agstone size in one operation. Producing any combination of sizes from 85% rock to 100% agstone, it takes wet or sticky material without clogging. Feed is direct from shovel. No intermediate conveyors or trucks required. Plant includes: 40 inch by 10 foot apron feeder; 4 foot by 8 foot, 2 deck vibrating screen; 36 inch belt conveyor; Caterpillar engine. Complete unit mounted on a chassis with 24 pneumatic-tired wheels. Crusher driven by V-belts from engine. All other equipment driven by individual electric motors, powered by separate generator set. Write or wire for details.

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THE DIXIE METHOD OF CRUSHING
Only a Dixie has the movable breaker plate... your assurance of greater production at less cost.

YOU SAVE VALUABLE SPACE...

Space is money. And by installing Multiclone equipment for your dust recovery you make vital space savings. The Multiclone requires as little as 1/6 the square footage – 1/4 the cubic footage of other equipment of comparable capacity!

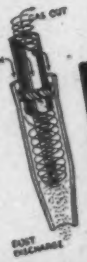
Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

YOU CUT INSTALLATION COSTS...

Note at right the simple "straight-through" duct connections of the Multiclone compared with complicated manifolding of conventional cyclone. Cuts installation costs, saves more space, reduces insulation expense.

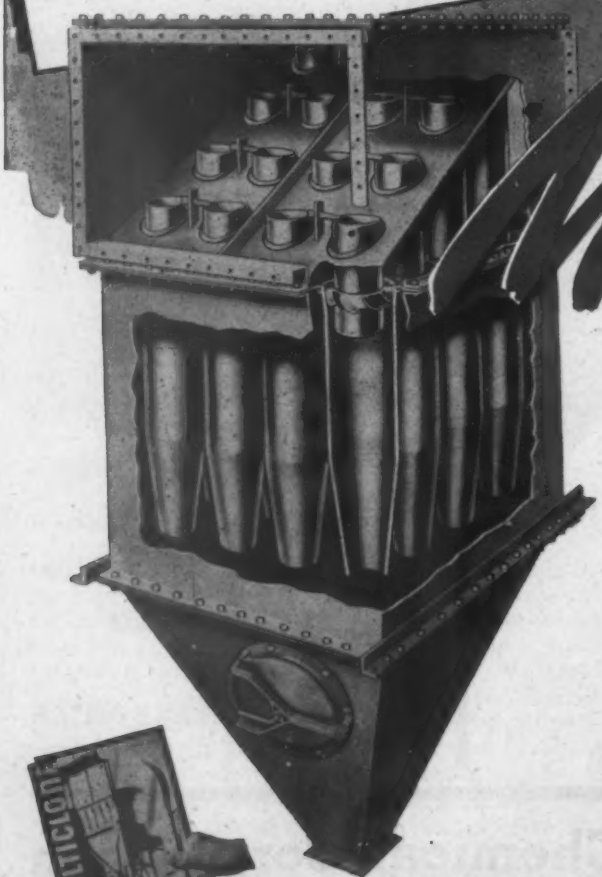
YOU BOOST RECOVERY EFFICIENCY...

Multiclone's many small diameter tubes generate higher centrifugal forces – greater cleansing action – than large diameter chambers. This means high recovery efficiency even of extremely small particle sizes.



YOU SLICE MAINTENANCE EXPENSE...

The Multiclone has no high speed moving parts to require frequent expense, no filters to clean or replace. And because recovered suspensions are discharged instantly and completely from gas stream, draft loss remains uniformly low at all times!



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The *Engineered* Recovery Unit!

IT IS no mere accident that Multiclone recovery equipment makes *so many* important savings in installation... in operation... in maintenance on all types of recovery operations, from the smallest to the largest. The Multiclone with its patented and exclusive *vane* design is the result of over 38 years of research concentrated on more efficient recovery of suspensions from gases, beginning with the first commercial application of the famous Cottrell Precipitator.

The one best way to discover the many savings Multiclone equipment can make is to let our engineers show you these savings applied to *your particular* job. A letter, wire or call to our nearest office places this helpful assistance at your service without obligation. Let us show you the facts — then you decide!

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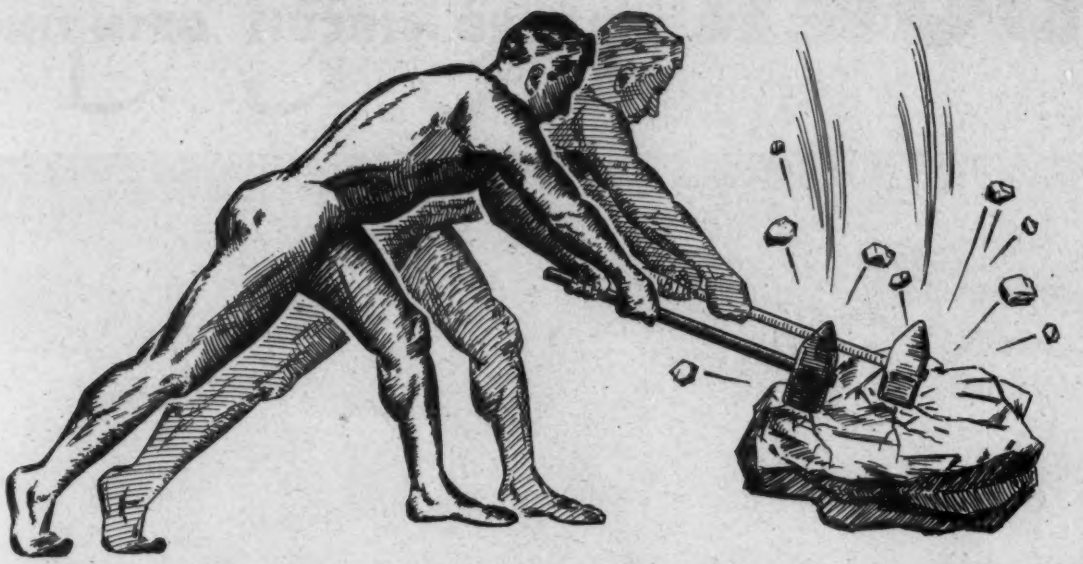
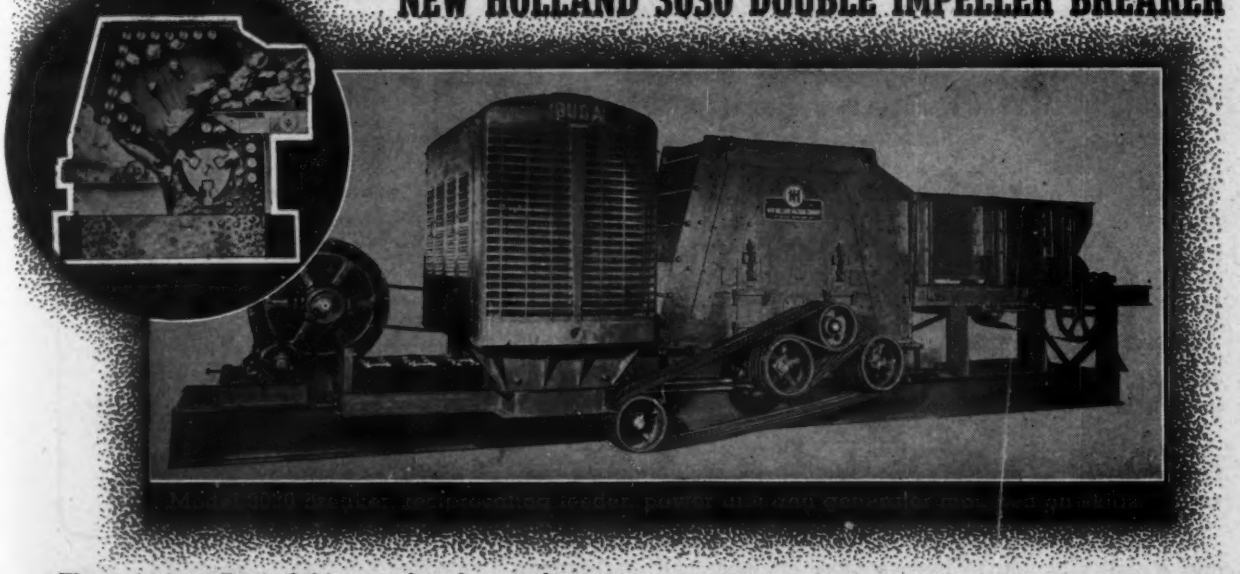


DUAL IMPACT!

. . . THAT'S THE REVOLUTIONARY NEW OPERATING PRINCIPLE OF THIS NEW HOLLAND 3030 DOUBLE IMPELLER BREAKER



The twin impellers of this new breaker pack a double punch . . . reducing 30 inch stone to minus one inch . . . at the rate of 100 to 150 tons an hour . . . with only 100 H.P. Aggregate and Aglime Producers everywhere are realizing new high levels of efficiency with this rugged Model 3030. Because it can do a primary and secondary job in one operation, many plant owners are using it for a complete breaking job in one pass.

For complete descriptive literature, write Dept. N-7.

DORR CLOSED CIRCUIT GRINDING

Permanente Cement Company—the world's largest installation of the Dorr C.C.G. system in the cement industry.

The Standard of the Cement Industry

The great 5,000,000 barrel per year plant of Permanente Cement Company at Permanente, California—largest in the world—uses Dorr Classifiers and Dorr Bowl Classifiers for two-stage closed circuit grinding, and Dorr Thickeners and Dorr Slurry Mixers for settling and correction.

Dorr C.C.G., as installed at Permanente and the plants listed at the right, has been the choice of virtually every new wet process mill built in the last ten years.

The reasons for this general acceptance of Dorr C.C.G. are two-fold—a better control of fineness leading to a better cement, and a lower grinding and slurry handling cost per ton of raw grind.

If you are planning to build a new mill or to modernize an old one, it will pay you to have a Dorr engineer call and explain Dorr C.C.G. as it applies to your particular conditions.

ADVANTAGES OF DORR C.C.G.

- Delivers up to 100 percent minus 200 mesh slurry at kiln-feed density.
- A finer, better-controlled raw grind—yielding a better final cement, low in free CaO.
- Greater grinding capacity from a given ball mill—less KWH per ton ground.
- Increased capacity from kiln and finishing mills.

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Permanente Cement Co., Permanente, Calif.
Pittsburgh Plate Glass Co., Zanesville, Ohio
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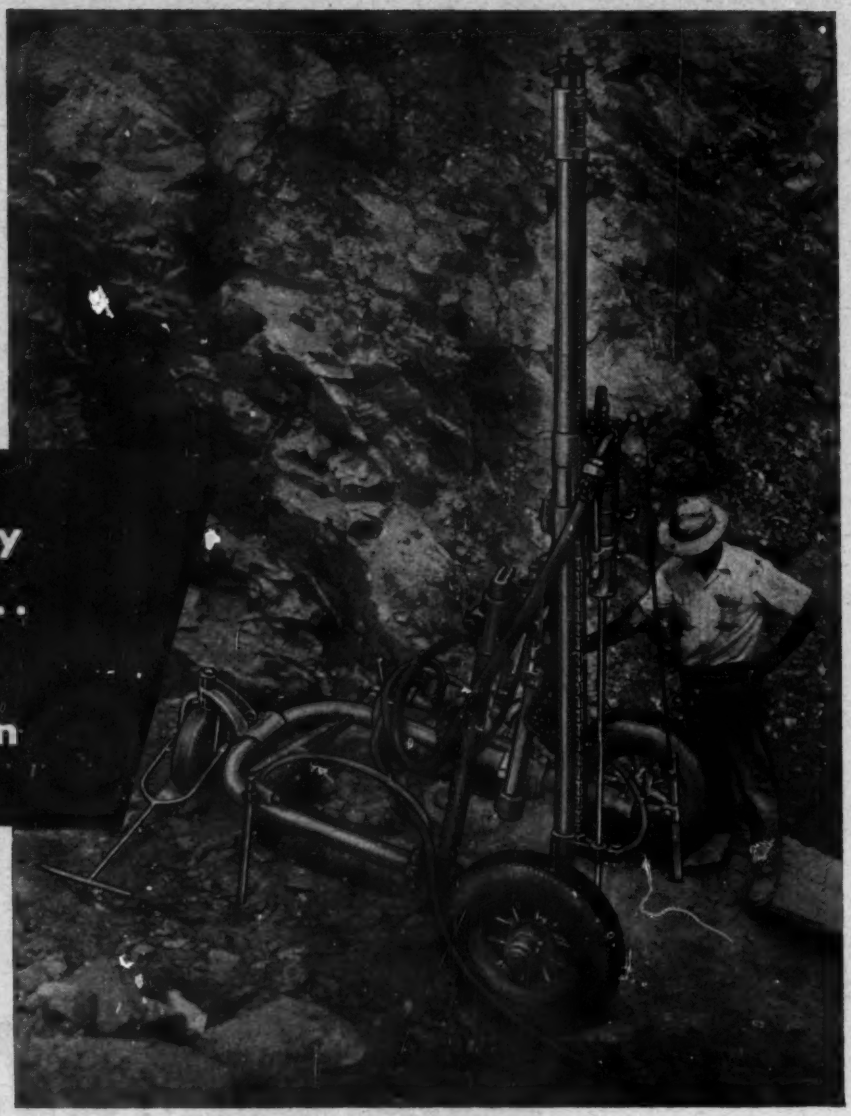

feed-in steady
return quick...
for operation
on any terrain

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Light-Weight
WAGON DRILL

Designed to drill holes at all angles on any terrain. Steady feed and quick return are features of the sturdy Chicago Pneumatic rotary air motor with graduated control, worm transmission and feed chain. There is ample power to pull tight steel.

However rough the terrain, the G-200 R Wagon Drill can be moved with ease and speed because the light, but rigid, tubular carriage is mounted on 3 roller-bearing pneumatic-tired wheels. Designed for fast operation; sliding cone permits rapid adjustments of drill steel to suit ground conditions.

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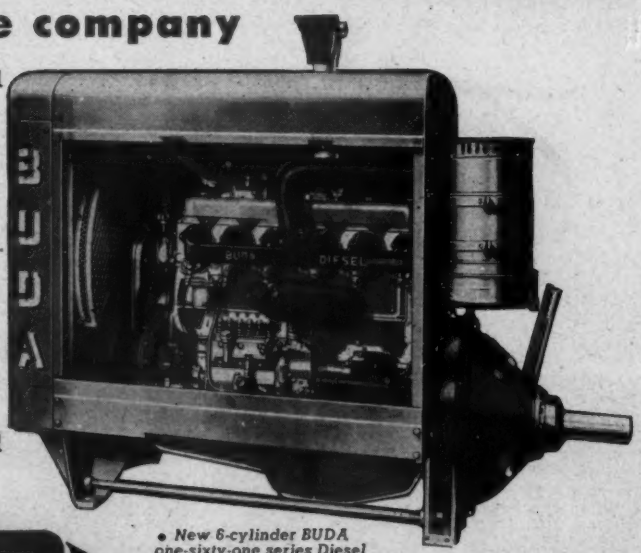

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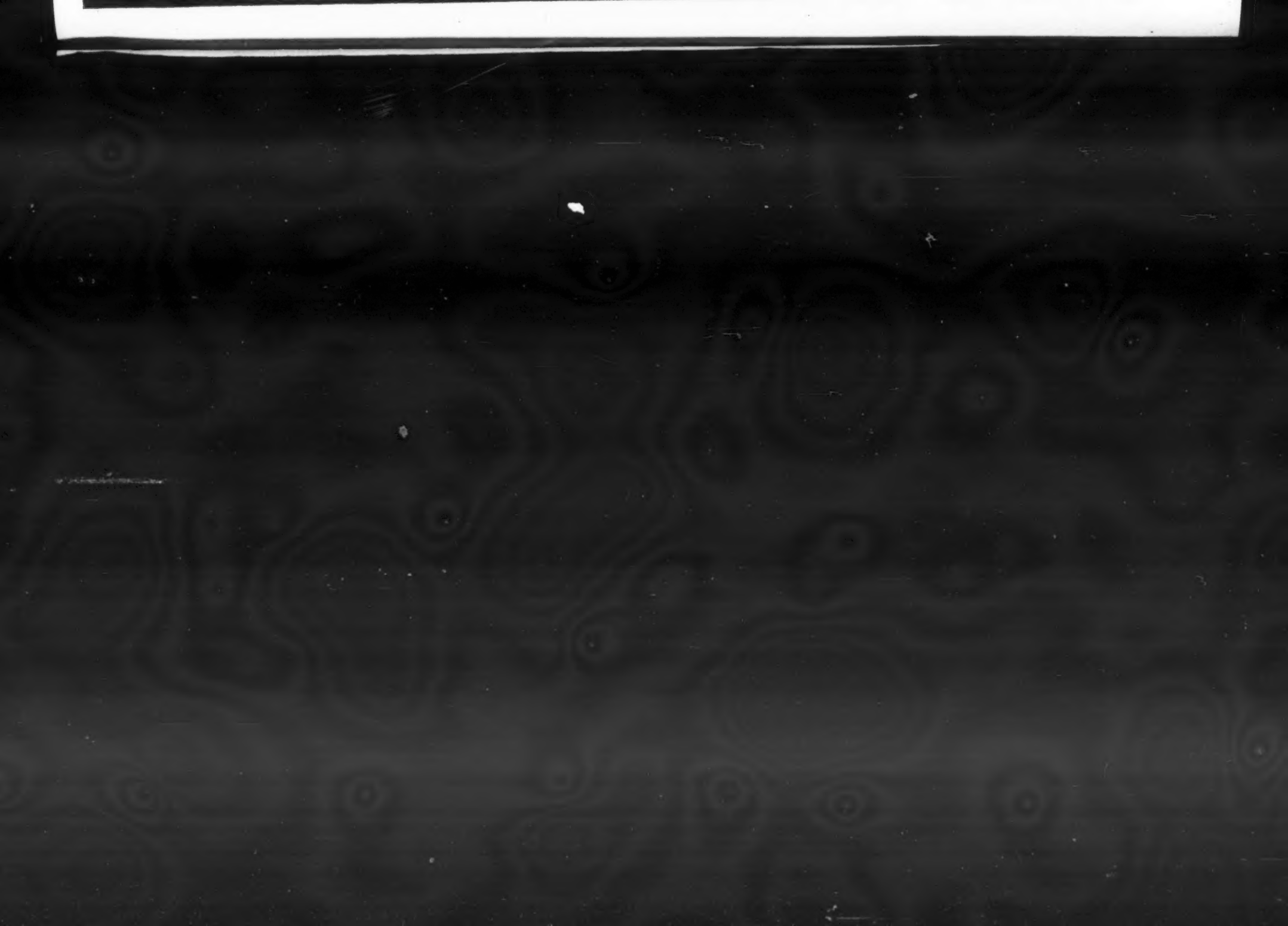

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Mangatone Does It Again!

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Tuolumne Gold Dredging Co., La Grange, Cal., operating 101 buckets on the line, was spending $15,000 a year in replacements and losing one day in 10 for "clean ups," due to lips of buckets wearing down ¼ inch at center every 10 days. Even more serious was the progressive loss in load and efficiency.

As a test, bucket lips were hard-surfaced with a 3/16 pass, 3 in. wide by 30 in. long of Mangatone N. M., with ¼ inch Isorod used as the "hot rod" in the "Two-Tone" application of the Mangatone N. M.

Results of tests showed conclusively that bucket lips hard-surfaced with "Two-Tone" stood up under most gruelling operations. Company engineers estimate net saving of $12,000 annually in bucket replacements alone, but consider that a minor saving.

The big factor is that the buckets will be maintained at peak measurements and efficiency, thus producing a full load going into the dredge month after month. This additional "take" in digging will make "the 12 grand look like penny ante."

Write for a copy of Bulletin No. 7, which explains "Two-Tone" process.

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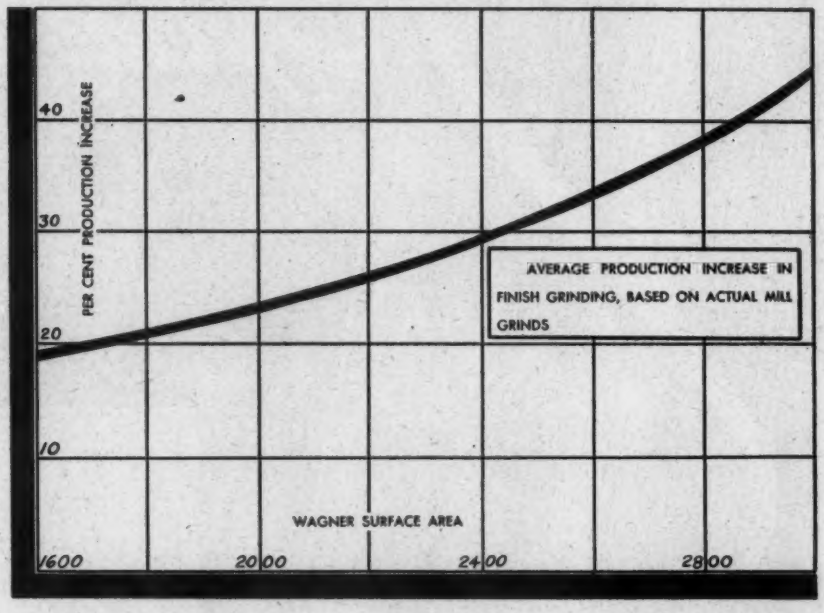
use TDA ★

While TDA is widely used in making high early strength cements, its presence improves many of the important properties of concrete so that many plants use it in all cements.



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TDA assures the manufacturer of a uniform product and one that improves the desirable properties of the concrete, particularly in strength, plasticity, and durability. TDA is *not* an air entraining agent.

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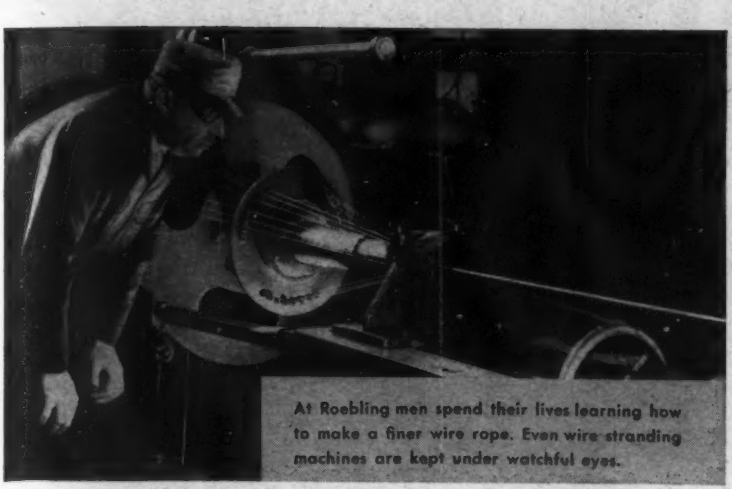
the right Wire Rope



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This extra care plus complete knowledge of rope making produce the wire rope that gives you extra service on the job.

TO GET THE BEST SERVICE . . . the most life from your wire rope, it's important to use the *right* rope for the job. You need the correct balance of strength and flexibility, plus the peak in fatigue and abrasion resistance. In the wide range of sizes and types of Roebling "Blue Center" Steel Wire Rope there is one that meets your exacting requirements.

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OLD MAN COMPETITION SAYS, *"Choose the rope that stretches the time between costly shutdowns."*

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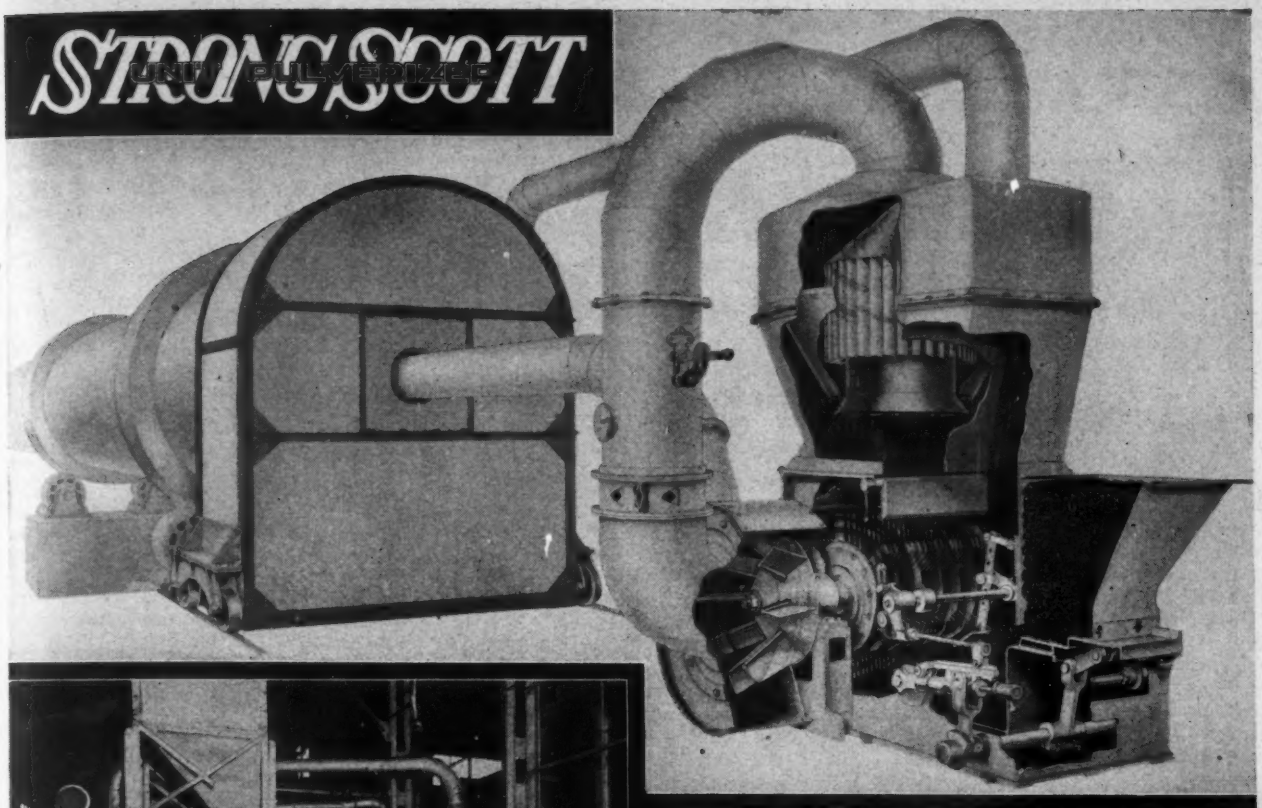

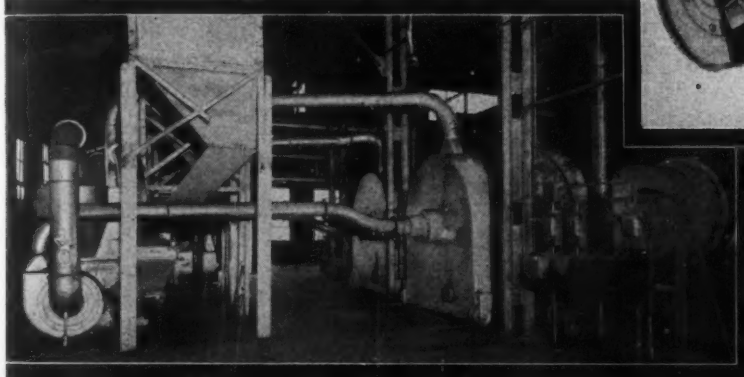

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A.S.T.M. Meeting in Buffalo

Cement, Aggregates, Concrete and Lime developments and tests presented by American Society for Testing Materials Committees

By NATHAN C. ROCKWOOD

DEVOTEES TO THE SCIENCE of studying and testing materials of construction had to put up with many inconveniencies in order to attend the 49th annual convention, in Buffalo, N. Y., June 24-28. Standing in line for meals and sleeping two in a bed were almost the regular routine, and just about every spare bed in the city was utilized. Nevertheless, the association got off to an enthusiastic post-war start, and several dormant committees, including C-11 on Gypsum and C-12 on Mortars for Unit Masonry, renewed activities.

The officers of the committees in which ROCK PRODUCTS readers are most interested were changed somewhat. The chairman, F. H. JACKSON, Public Roads Administration, of Committee C-1 on Cement, was reëlected, as was also the secretary, GEO. E. WARREN, Southwestern Portland Cement Co. A new vice-chairman was elected, W. H. KLEIN, Pennsylvania-Dixie Cement Corp. Committee C-7 on Lime reëlected PROF. W. C. VOSS, Massachusetts Institute of Technology, chairman; J. A. MURRAY, Warner Co., reëlected vice-chairman; L. K. HERNDON, Ohio State University, former secretary, was elected vice-chairman; and DR. G. J. FINK, National Bureau of Standards, was elected secretary. Committee C-9 on Concrete and Concrete Aggregates elected PROF. K. B. WOODS, Purdue University, chairman; reëlected STANTON WALKER, National Sand and Gravel Association, secretary; and elected FRED HUBBARD, National Slag Association, vice-chairman.

Committee Reports

Committee C-1 on Cement did not have anything very startling to report, but one action taken is of much interest. The subcommittee on the effects of alkalies in portland cement on the durability of concrete has unloaded most of its work on a new subcommittee of Committee C-9 on Concrete and Concrete Aggregates, on the theory that it was a concrete problem rather than a cement one. At least it should have the effect of directing attention more to the chemically reactive aggregates than to the alkali cements. However, Committee C-1 will continue to study the cement factor.

The subcommittee, or working committee, on sulphate resistance submitted a progress report which contains tables giving very complete data on chemical analyses, which in addition to including the usual SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, SO_3, Na_2O, K_2O also has FeO, TiO_2, P_2O_5 and Mn_2O_3 contents of the cement. Also, there are the calculated percentages of C_3S, C_2S, C_3A, C_4AF and $CaSO_4$. The increases in expansion and weight of 1:5 Ottawa standard sand bars made from these 10 cements are given in detail, so that all investigators can examine them and draw their own conclusions. The chemical analyses are chiefly interesting to the casual reader in that there are wide variations in the percentages of the minor minerals—TiO_2 P_2O_5 and Mn_2O_3, the sum of all three exceeds 1 percent in only two cements, and these exceptions were caused by unusually large percentages (relatively) of Mn_2O_3.

One of these seems to have had less than average resistance in the sodium and magnesium sulphate tests, but this cement was also highest in C_3A.

Committee C-7 on Lime held a free-for-all discussion of the new Proposed Tentative Specifications for Hydrated Lime for Masonry Purposes and Proposed Tentative Specifications for Hydrated Finishing Lime. These included the specifications for the so-called S-Hydrates, the new hydrated limes in which a large percentage of the magnesia has been hydrated by steam pressure or otherwise. These had been adopted by better than a two-thirds vote of the committee and were recommended to the Society for its adoption. These specifications have had hard going for several years, but since the Federal Government has adopted similar specifications, the few "conscientious objectors" in the lime industry have about given up the struggle. The Standard Specifications for Normal Finishing Hydrated Lime have been revised to distinguish the difference —in hydrated oxides and in early plasticity.

The subcommittee on Lime for the Chemical Industries reported progress, but there are several members of the committee who still question the feasibility of an over-all specification for industrial or chemical lime.

Committee C-9 on Concrete and Concrete Aggregates reported progress in reorganization of subcommittees so that there will be more of them and with more specific objectives. Two new subcommittees are being set up, one on admixtures for concrete which will include admixtures at mixing or batching plant as well as admixtures interground with the cement; the other new subcommittee will take over much of the work formerly assigned to Committee C-1 on Cement, which is the effect on concrete of "chemically reactive" aggregates. The rest of the committee report had to do with minor revisions in methods of testing and in definitions of terms. It may be of general interest to learn that the A.S.T.M. definition of "sand" has now been made comprehensive enough to include by inference stone sand and slag sand. Crushed stone now includes crushed boulders and crushed large cobblestones."

Technical Papers

At one session six papers on cement and concrete were presented in abstract form. Another session—from 8 p.m. to midnight—was devoted to a symposium on freezing and thawing tests. A third session, of some interest to the aggregate industry was devoted to bituminous materials.

AIR-ENTRAINING CONCRETE: F. B. HORNIBROOK, HOWARD FREIBURGER and ALBERT LITVIN, all of the Master Builders Research Laboratories, presented a paper "A Study of Durability and Void Characteristics of Concrete Containing Admixtures, Principally of the Air-Entraining Type." Their conclusions tend to verify those of other investigators that "the durability factors of the concretes were, with one exception, materially lower for concretes containing less than 3 percent by volume of total air, than for concretes containing about 6 percent or more."

LEAKAGE THROUGH MORTAR: JOHN W. MCBURNEY, M. ARNOLD COPELAND and RUSSELL G. BRINK, National Bureau of Standards, reported on a controversial subject: "Permeability of Brick Mortar Assemblages." Three types of cement-lime mortar were used: 1:¼:3; 1:1:6 and 1:2:9. While it was admitted that the brick was the main variable, the conclusions were adverse to the 1:2:9 mortar, because it permitted leakage through walls that did not leak with the mortars of higher portland cement content. With relatively impermeable brick, the high cement mortar gave excellent results; with more permeable brick no mortar gave entirely satisfactory results. H. F. GONNERMAN,

(Continued on page 168)

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A.S.T.M. Meeting

(Continued from page 166)

Portland Cement Association, suggested the possibility of increasing the plasticity of cement mortars by using air-entraining cements. DR. F. O. ANDEREGG said that resistance of brick masonry to leakage increased with exposure; PROF. HOWARD F. STALEY, Massachusetts Institute of Technology, insisted that the Bureau of Standards test results were not born out in actual practice.

GYPSUM IN CEMENT: WILLIAM LERCH, research chemist, Portland Cement Association, reported at considerable length, on "The Influence of Gypsum on the Hydration and Properties of Portland Cement Pastes." This is the most comprehensive discussion of the subject yet made and includes a bibliography up to 1941, inclusive. In his extemporaneous remarks he also referred particularly to the artcle by A. G. Whittaker and V. E. Wessels on the same subject in ROCK PRODUCTS, August, 1945. The conclusions are that for many cements the strengths can be increased and the contraction on drying decreased by the use of larger additions of gypsum than are permitted by current specifications. The quantity required to obtain the best strength and the least contraction can be used without danger of abnormal expansion in water storage. The experiments show that the fineness, the amount of alkalies and the amount of $3CaO \cdot Al_2O_3$ content all influence the gypsum requirement. The paper contains a description of the function of gypsum in regulating the reactions of hydration and hardening. In short, the function of effect of gypsum in portland cement is far more important than hitherto assumed.

MODULUS OF ELASTICITY OF AGGREGATE: H. A. LA RUE, University of Missouri, presented a paper on "Modulus of Elasticity of Aggregates and Its Effect on Concrete." The Missouri State Highway Department has had numerous troubles with concrete pavement aggregates, and has tried many ways to differentiate the good from the bad actors. The present studies are confined to limestones from different parts of the state, having both high and low moduli of elasticity. The tests of concrete cylinders were made to find the relation between the modulus of elasticity of the limestone aggregate and the modulus of elasticity of the concrete made with it, using the same cement and sand in the various tests. Among the conclusions arrived at were these: Aggregates produce a decided effect on the elastic properties of concrete, aggregates having a high modulus of elasticity develop correspondingly higher moduli in the concretes than aggregates having low moduli; but that no correlation exists between the compressive strength of concrete and the modulus of elasticity is evident from these data; since the mor-

tar has an important influence on the elastic properties of the concrete, it serves to modify the effects of the coarse aggregate on the moduli of the concrete; there are many variations in the characteristics of concrete, even in different portions of a single mass of concrete, or from a single batch of concrete.

PARTICLE SIZE: EUGENE V. BARRETT, chief, Materials Testing Laboratory, Ministry of Public Works, Venezuela, presented "A Method of Particle Size Determination of Soils, Cement, etc., by Means of a Chainomatic Specific Gravity Balance." This method, according to the author, permits accurate determination of the specific gravity of a suspension of fine particles in a liquid medium at any determined depth. The use of this method eliminates the computations and corrections of the hydometer method and permits the determination of the percentage of soil particles finer than 0.0015 mm. (1.5 microns) to be made in 72 min. instead of 24 hrs. required by the hydrometer method. The determination of the specific surface of a sample of portland cement can be made in 7½ min., particle size being determined to 0.005 mm. (5 microns). Check tests of soil samples indicate that this method is more accurate and has better reproducibility than the hydrometer method. Check tests of cement samples indicate the specific gravity balance method is as accurate as the turbidimeter method.

Concrete Asphalt

CONCRETE-ASPHALT FLOORING: DR. F. O. ANDEREGG, John P. Pierce Foundation, described "Concrete Flooring with Asphalt Admixture." To overcome the disadvantages of a hard, rigid portland cement floor on the one hand, and the deformable, indentable asphalt floor on the other hand, Dr. Anderegg has developed a suitable combination of cement and asphalt, which produces a floor with much better cushioning effect than straight portland cement concrete and capable of giving satisfactory service under wheeled trucks. In the system developed, the asphalt is present as a discontinuous phase. The resultant alteration of the rheological properties of the concrete are discussed and the procedures are given which were developed in laying a series of floors in several farm buildings and in a large laboratory, with detailed report on the physical properties of the floor mixtures. A mixture that seemed to give excellent results required approximately 3½ bags of cement and 7 gal. of asphalt emulsion per cubic yard of concrete, the ratio of sand to stone being determined by the necessity of maintaining workability. Compressive and flexural strengths were generally reduced by the addition of the emulsion, but the flexural strengths did not suffer as much ap-

(Continued on page 170)

parent loss as the compressive strengths.

Freezing and Thawing

The general discussion of the technique and the discordant results of laboratory tests on the freezing and thawing of concrete was interesting but more confusing than enlightening to the uninitiated listener. Enough evidence was given that so much depends on the degree of saturation of the specimen, the rapidity of the freezing and thawing cycle, whether the specimen is frozen in air or water, etc., that all kinds of results can be obtained in the number of cycles before failure. The test is designed as an accelerated weathering or exposure test, but until much more standardization is established it is practically impossible to relate one laboratory's results with another's.

PROF. M. O. WHITHEY, University of Wisconsin, led the discussion with a paper, "Considerations involved in Making Freezing and Thawing Tests of Concretes," which includes a fairly complete bibliography. He concluded: Further research is required to eliminate the spread between the results of individual specimens supposedly of the same concrete tested in the same laboratory under the proposed (A.S.T.M.) procedure, before this procedure should be proclaimed standard. Some factors which cause discordant results he named as: variations in the degree of saturation of the coarse aggregate at the time of mixing the concrete, small variations in the air content of individual specimens due to discrepancies in mixing the concrete, and its bleeding after molding, variations arising from the variable conditions during the initial curing period, and variations in the degree of saturation of the specimens when frozen.

All the discussion tended to confirm these conclusions, and various other curious factors were introduced. PROF. R. E. DAVIS, University of California, for example, said the cement which had been aged for 8 months showed much better resistance in concrete freezing and thawing tests than cement that was only 11 days old. One experimenter said loss of weight and expansion were good indexes of the resistance to freezing and thawing. Others said the loss of weight was negligible. And to cap the climax there is no agreement among the experts that laboratory freezing and thawing tests bear any relation to weathering resistance.

Bituminous Mixtures

One paper at the session on bituminous materials is of interest to aggregate producers. JOHN C. SPRAGUE, engineer in charge, Division Materials Testing Laboratory, South Atlantic Division, Corps of Engineers, U.S.A., gave the results of a "Laboratory Investigation of Anti-Stripping Admixtures used for Promoting Wet-

ting Power and Adhesion between Bitumens and Aggregates." The anti-stripping materials were not identified, but it was concluded that none of the nine admixtures could be said to have an over-all efficiency for the range of nine aggregates (from a dense granite to a porous coral) and three different bitumens. None of the admixtures would promote wetting power of asphalt AC-8 when mixed with surface-wet aggregates; nor would any of them sufficiently promote the wetting power of any of the bitumens tested when mixed with the surface-wet, porous lime rocks. Practically all the admixtures were quite effective with the surface-dry aggregates, and several of the admixtures were very effective with several of the surface-wet aggregates in promoting wetting power, stripping resistance, and stability.

Grind Cement Too Fine?

(Continued from page 107)

cement. It was surprising that 80 percent of the companies that commented (in numbers) believe that cement is being ground too fine. Supporters of fine grinding believe that many concrete failures are due to improperly made concrete. They may have something there for, according to reports like Mr. Swayze's on the German cement industry (this issue), very durable concrete is being placed despite cement that is inferior to that manufactured in this country.

A supporter of fine grinding commented as follows:

"Our answer is no. It is a generally well-known fact that only the 'fines' in portland cement are cementitious, the 'coarse particles' being equivalent to so much sand. To use it as such is obviously an economic loss, since 'sand' costs much less than 'cement'; therefore, why not reduce those coarse particles to cement?

"It is our belief that many concrete failures, which have been attributed to fine grinding of cement, have been really due to improperly made concrete, having to do largely with proportioning. Obviously it requires less of the finely ground than it would of coarsely ground portland cement to produce the same strength. The dangers inherent in too rich mixtures are as great or greater than the dangers inherent in too lean mixtures. The general practice of proportioning the cement, sand, and coarse aggregates in concrete has not been adjusted to the modern, more finely ground and more efficient portland cements.

"In modern concrete practice too much importance has been attached to strengths—*too little to durability*, and concrete in many instances contains *too little* small inert material in its aggregates.

"In a word—improvements in the making of concrete have not kept pace with improvements in the mak-

(Continued on page 172)

Grind Cement Too Fine?

(Continued from page 171)

ing of its most essential ingredient—portland cement."

One of the smaller manufacturers said:

"The demand for early strength, and air-entraining has forced many manufacturers to grind to a fineness that is well beyond the 'critical fineness' of their cement. The writer has found that there is a decided point (not same in all) beyond which all cements should not be ground. This point is not definitely based on a screen analysis or on a surface area determination. These points vary with type of grinding.

"One cement came to our laboratory a few days ago that was dangerous to use on any work except building block where the mix must be kept *'very dry.'* Its 200 mesh fineness was 99 percent passing. There was much of it that could never help the customer in general concrete work, as it would be completely hydrated before placed in a definite or final resting place.

"Cement was in our opinion much better when its fineness was not nearly what it is today. When a cement at 1550 surface area or 86-88 percent minus 200 mesh is not satisfactory in strength, there is quite something wrong in composition or manufacturing procedure. In plain words, we feel the race for fineness is heading us toward much more trouble than the extra costs of making it."

One of the very large manufacturers commented:

"There have been many changes in portland cement from time to time, making it difficult to answer definitely the question of whether fine grinding has been carried beyond the point where it produces the best cement for general usage. For example, during the past 20 years the strengths of portland cement have doubled. This demand on the part of the purchaser for higher strength required finer grinding. We know, of course, there are people who incline to the opinion that fine grinding of cement has been carried too far. With finer grinding came modern grinding units which reduced and in most cases eliminated leakage of grease into the cement during grinding. This grease in most cases increased the air entrainment. In our opinion this air entrainment was of greater importance to the durability performance of cement in concrete than were any changes that were made in the fineness of cement."

A California manufacturer said:

"If I were asked to submit proof in the matter I would be hard-pressed but I would personally answer the question by saying that I do believe fine grinding has been carried too far. I hope some day we can submit proof that will be convincing one way or another but right now we do not have it. There are, however, indica-

tions that to me point unmistakably to the desirability of much coarser grinding than the present practice. I submit for your own consideration only this one thought. In the presence of moisture, concrete will continue to hydrate and grow in strength as long as there is unhydrated cement available. Once hydration is complete, further reaction of cement and water can only be the reaction of disintegration. If we could so design our mixes and continue the curing operations and control the exposure so that when the last cement particle is fully hydrated the mass would be completely dense with no available water and no opportunity for any water to become available, then we could safely utilize the advantages of fine grinding. In the absence of such an end, unattainable under normal conditions, a more coarsely ground cement seems to me to be desirable. However, our present finish mill capacity is adequate for grinding our cement to any fineness specified by the customer."

Criticize Mix Design

Criticizing concrete mix design, a manufacturer in the north said:

"It appears that fine grinding (and increased C_2S content) to develop earlier strength may have contributed somewhat to the more rapid deterioration of the more recent concrete pavements. Our opinion is that the quality of the cement has not been lowered but that the pavements were not given adequate curing and were opened on the basis of strength requirements. Apparently no changes were made in the concrete mix design to compensate for the finer grinding and the curing time was shortened. Perhaps construction engineers should redesign their mixes to take care of the higher strength developed by the cement and then retain the old curing methods.

"The disadvantage of too coarse grinding is a cement that tends to bleed more readily and this tends to produce less durable concrete. It seems to us that the use of too much water (general conditions) in the mix and the hurry up curing methods have contributed to the poorer grade of concrete of recent years."

A California manufacturer suggests that the type of grinding employed deserves study, in the following:

"In some extreme cases fine grinding of cement has obviously been carried to excess. However, it is, in my opinion, a debatable question whether moderate increases in fineness have been generally beneficial or detrimental. The facts needed for a firm opinion on this point are not yet available and any determination of such facts should include the effect of air separation in the finish end on the qualities required for a good all-purpose cement."

A large manufacturer, with multiple plants and research laboratories

Grind Cement Too Fine?

(Continued from page 173)

that have studied the problem intensively, commented:

"The present fineness of our standard cements, in our opinion, is not excessive and cannot be considered a factor in faulty concrete. We believe a limitation of fineness for portland cement between 1700 and 1800 surface area would be helpful. If finer cement is required, then a high early strength cement should be used, and here too we are of the opinion the maximum fineness should be limited to about 2600 surface area. It is often pointed out that the old-time cements furnished concrete which was more durable than our present-day cements. With all the various factors entering into the making of concrete, it is difficult to attribute the good quality of concrete made 25 years ago entirely to the fact that a coarser ground cement was used. In the objective tests of our laboratory, using identical materials and identical workmanship, the finer ground cements did not produce a concrete that was less durable than a concrete made with the coarse ground cements."

From California, a manufacturer wrote:

"I am a firm believer that we have gone far beyond the efficient point in fine grinding of cement. I do not base this opinion on my own work but I believe that if you will investigate the structures built before fine grinding was in vogue and those built thereafter, that there is a marked difference in the durability in the structures built with coarser ground cement than those at present being used, both by specification and because a contractor likes fine ground cement because it is easier for him to place."

Another large manufacturer expressed his opinion, based on research, in the following:

"In the opinion of our own research department the benefits of increased early strengths gained from excessive fine grinding are more than offset in the long run in general concrete construction by lessened durability. There are doubtless occasions for using a fine ground cement where a large percentage of ultimate strength is required at the earliest possible time. In general it is our opinion that a more coarsely ground product with a gradation from extreme fines to fairly coarse particles (perhaps without the use of air separators) will result in a setting action taking place over a longer period of time with steadily increased strengths and a tendency toward prolonged durability which the extremely fine ground uniform sized-particle cement will not produce."

A southern manufacturer, who apparently refers to the use for competitive selling purposes of various

finenesses of portland cement at standard prices, commented:

"We thing that probably fine grinding can be carried too far but we doubt if it has been done to any considerable extent. We hear, however, that a rather absurd condition has developed in Texas in regard to this. In our opinion there is justification for the idea that concrete made since about 1925 is frequently less durable than older concrete. In our opinion this is due mainly to the craze for high 3-day and 7-day strengths that came in about that period which required mills to strive for a much higher tri-calcium-silicate proportion. We followed this tendency reluctantly after standing out against it for several years and losing some good customers. In making structural changes in our own mill from time to time, we notice that our old concrete is much tougher than the newer. The present solution, as we see it, is for engineers to specify type B cement (moderate heat of hardening) rather than type A cement. In this way they get a composition similar to the earlier cements and we think the results will be favorable. A good many of our customers are already doing this."

Industrial Sand Meeting

A SPECIAL MEETING of the National Industrial Sand Association was held in Cleveland, Ohio, on July 12 to discuss and act on several urgent matters before the industry.

At this meeting the association decided to approve the program of the Industrial Hygiene Foundation of America to make an industry-wide survey of the dust problem. It was the sentiment of the membership that a survey would not only develop sound public relations for the industrial sand industry, but would also point the way toward acceleration of the industry's program in reducing the severity of the dust problem.

The question of continuance of the O.P.A. was brought up. If legislation is finally passed and signed by President Truman extending O.P.A., price controls on industrial sand will be reinstated but it was believed that these controls insofar as industrial sand was concerned would last only a short period as O.P.A. would issue an order suspending industrial sand price controls. Bureau of Mines figures show that industrial sand production in the period from 1939 to 1944 increased by 108 percent without the development of inflationary prices. The average value per ton in 1939 was $1.21 with a production of 8,679,629 tons and in 1944 had only increased to $1.37 a ton with a production of 17,685,723 tons.

Announcement was made that the semi-annual meeting of the association would be held at the Edgewater Beach Hotel, Chicago, Ill., on October 24 and 25.

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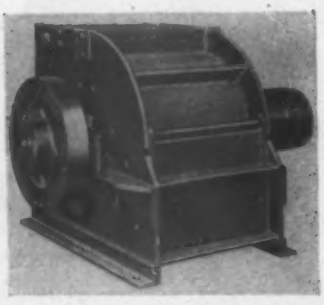

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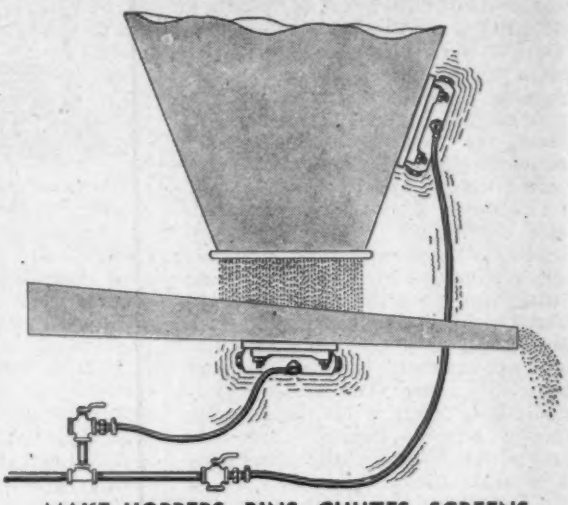

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Warner Co.	.15	June 26

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FLORIDA PORTLAND CEMENT CO., Hookers Point, Fla., had a net profit of $136,662 for the three months ended March 31, 1946, as compared with $50,666 for the first quarter of 1945. Net sales in the first quarter of 1946 were $828,539 as against $751,927 for the first three months of 1945.

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CONSUMERS CO., Chicago, Ill., had a net profit of $356,830 for the year ended December 31, 1945, as compared with $324,647 in 1944. Chairman Robert C. Fenner reported that for the first time in a number of years, the company showed net earnings in the first quarter of a year. Usually, due to inactivity of quarries and sand and gravel plants, earnings dropped to a low level in this period. Net was $13,273 for the first quarter in 1946 as compared with a net loss of $82,124 a year ago.

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LEHIGH PORTLAND CEMENT CO., Allentown, Penn., reported the following statement of income for the years ended December 31:

	1945	1944
Net sales	$14,652,302	$13,378,374
Cost of sales	9,659,413	9,007,712
Depreciation and depletion	1,535,983	1,639,453
Selling, etc., expense	2,465,727	2,364,616
Operating profit	991,179	366,593
Other income	270,563	221,018
Total income	1,261,742	587,611
Fed. income tax	482,000	187,000
†Excess profits tax	.....	900
*Inc. tax adj., net	.....	cr 700,000
Net income	779,742	1,099,711
Preferred divs.	57,167	226,964
Com. dividends	839,025	726,192
Surplus for year	d 116,450	146,555
Earn. surplus, 1-1	4,090,378	3,943,823
Earn. surp., 12-31	3,973,928	4,090,378

*Claim for refund of prior year's Federal taxes resulting from carry-back of unused excess profits credit, less applicable reduction of post-war refund of $150,000.

†Subsidiary company.

The company anticipates that shipments of cement in 1946 will be from 25 to 30 percent greater than in 1945. Earnings prospects have been improved by the recent increase in O.P.A. prices. A fund of $4,000,000 has been segregated for deferred construction and improvements. Authorized work and that which has reached the blueprint stage is about $3,000,000, not all of which will be completed in 1946. It is also hoped that construction of a new plant on recently acquired property near Minneapolis may be started soon.

Testimony In Cement Dust Suit

Steps taken by Washington-Idaho Lime Products Co., to arrest dust held to be inadequate to prevent injunction

In the April, 1945, issue of Rock Products, announcement was made that Washington-Idaho Lime Products Co., with plant at Orofino, Idaho, had suspended operations as the result of a decision of the District Court of Orofino to enforce an injunction restraining the company from operating its cement plant so as to deposit dust on the property of J. L. McCarthy and Ed. Gaffney, plaintiffs. This order also forbids the company to permeate the atmosphere of the area in question with "obnoxious odors."

As a result of the injunction there was no alternative, according to the announcement by President Otto C. Frei, but to suspend operations completely; and the decision was made to abandon the plant as soon as stocks were depleted with the intention of relocating in another State from which the company's market could be served.

The decision handed down by District Judge A. L. Morgan on March 12, 1946, was drastic, inasmuch as it forced the closing of an industry that was the largest single employer in the area, despite the fact that the company, according to the court records, which have been made available, had taken ordinary steps to minimize the escape of dust.

Washington-Idaho Lime Products Co. is incorporated under the laws of the State of Washington, has a plant investment of $375,000 and a capacity of 600 bbl. of portland cement per day, manufactured by the wet process. Employment averaged 35 men. Operations started in 1936.

Complaint

Attorneys for the plaintiffs filed a complaint on July 13, 1945, which was followed by oral testimony and the filing of briefs by both defendant and plaintiffs. The complaint outlined a description of the location of Orofino, in a valley with a range of high hills forming the northwesterly boundary of the city, homes of the plaintiffs being located at the base of this hill, which influenced the travel of air currents. The plaintiffs alleged that the cement plant, located approximately six city blocks in a northeasterly direction from their homes (just outside the city limits) discharged smoke from its stack carrying "obnoxious and offensive odors" together with a sediment resembling cement and that the smoke and substances were carried by the wind to deposit around and inside their homes. It was claimed that a "cement-like" substance was deposited on the furniture and fixtures within their houses and that the "stenches" and "obnoxious odors" were offensive to the senses of those occupying the houses. Great issue was made of the "impairment" of the comfort of the plaintiffs and their families and their health as well as the enjoyment of their homes, and the "interference" with the comfortable enjoyment of their property.

It was further alleged that the defendant did not use modern appliances for controlling smoke and odors and that, despite complaints by the plaintiffs, the defendant had repeatedly promised and agreed to install proper appliances to control smoke and odors but had failed and refused to comply with his promises.

Defendant's Reply

The defendant denied these claims and alleged that the plaintiffs were not entitled to relief for these reasons (from the Court record):

(a) "Plaintiffs have slept upon their rights and show no excuse for their laches in asserting them.

(b) "Plaintiffs' claims and demands set forth in their complaint are stale, and plaintiffs have not acted in good faith and with reasonable diligence in asserting the same and by their acquiescence and conduct have encouraged, invited and caused the defendant to expend large sums of money for the purpose of improving its property and equipment to maintain, operate and enlarge the purposes for which this manufacturing plant has been operated for the past several years.

(c) "Plaintiffs do not show any excuse for not demanding earlier the relief prayed for by their complaint.

(d) "Plaintiffs have never taken any action to assert their alleged claims or to interfere with the long operation of defendant's plant, and plaintiffs' claims to the relief now prayed for are now barred by the inexcusable laches and negligence of the plaintiffs."

It was further alleged by the defendant that he had, since the original construction of the plant, expended large sums of money for the furnishing of the latest approved methods and equipment as were from time to time developed and recommended and that at no time had operation of the plant been injurious to the health of the plaintiffs or an obstruction to the free use of their property or had it interfered with the comfortable enjoyment of the life or property of the plaintiffs or the general public.

Memorandum Opinion

Detailed study had been made of the prevailing air currents which late in the evening, travel from an easterly direction past the plant, west to southwesterly following the contour of the hills and approximately the reverse direction in the morning, in reaching the conclusion that evidence was positive that dust conditions were bad throughout the section in question.

Recognition was given to the fact that the company installed dust collecting equipment during the winter of 1940-1941 and that the installation, to a marked degree, did lessen both the dust and the odor in certain residential sections. It was further agreed that discharge from the plant through a 100-ft. stack is directly into air currents circulating along the contour of the hills, inaccessible to other sources of dust in the area.

Much testimony was heard from residents in the effected area claiming that windows could not be opened, that deposits within homes could not be removed by ordinary methods, that furniture was damaged in its removal, that the odor was nauseating, that sediment deposited on automobiles could not be removed except by acid, etc. Importance was placed on the contour of the hill and its effect on air currents in establishing that the cement mill was at fault.

In his memorandum opinion, the Judge stated that considerable testimony had been introduced to show that the cost of installing a dust control and odor control system that would practically eliminate all the trouble was prohibitive. This testimony, according to the record, was by experts and "seemed to be based to a considerable degree upon the proposition that the cost was prohibitive because the recovery of raw material by the defendant would not justify the expense" and there was no testimony as to the company's financial ability to install this equipment.

It was further pointed out that it was not necessary to install the plant at its present location, which is 3½ to 4 miles from the quarry, on the opposite side of the city and that efforts of President Otto Frei to remove the plant to another location had been refused by the Board of Directors.

Several cases were cited in which judgments had been handed down. In the case of Everett et ux vs. Paschall, Wash., the ruling was that no individual or corporation has the right to so use his or its property as to inflict discomfort or inconvenience on another in an attempted use of his own property for his own purposes.

In the case of the Baltimore and P. R. Co. vs. Fifth Baptist Church, Washington, D. C., which laid down a ruling considered applicable in this

(Continued on page 190)

Manufacturers' News

Goodyear Tire & Rubber Co., Akron, Ohio, has announced the appointment of Ian D. Patterson to the newly created post of assistant manager, chemical product development division. Mr. Patterson started with the company in 1921 as a chemical engineer and tire compounder.

Electric Machinery Mfg. Co., Minneapolis, Minn., has appointed Russell Ranson, Charlotte, N. C., as sales representative for North Carolina and South Carolina.

General Excavator Co., Marion, Ohio, has announced the appointment of L. O. McLean as sales manager, succeeding Don B. Smith, who has resigned. Mr. McLean has been with the company since 1920. He studied engineering at the University of Mississippi and graduated from Cumberland University. His first position was with the Illinois Central Railroad where he became resident engineer in charge of construction. He founded the McLean Construction Co., Pittsburgh, Penn., and later entered the sales field as a distributor for The Osgood Co. and other manufacturers of construction and excavating equipment. Then he was Eastern sales manager for the Michigan Power Shovel Co. where he pioneered the use of rubber tires on excavators and cranes. He has also developed many new designs in excavating equipment, several of which have been patented. Although his headquarters and home will remain in Marion, he will continue his field trips as sales manager and will cover all important conventions and equipment shows.

L. O. McLean

American Brake Shoe Co., New York, N. Y., has announced the appointment of J. F. Weller to the newly created post of sales assistant to the president. He was formerly director of automotive sales for both the Kellogg Division and the American Brakeblok Division.

Caterpillar Tractor Co., Peoria, Ill., has appointed George T. Lundberg as assistant to H. S. Eberhard, vice-president in charge of manufacturing; engineering, research and training. He was formerly supervisor of transmission design in the engineering department.

Goodyear Tire & Rubber Co., Akron, Ohio, announces that W. A. Lovell, district manager, San Antonio, Texas, has been named New Orleans district manager, succeeding R. J. Thoman, who has resigned to enter business for himself. L. W. C. Dye, assistant district manager at Kansas City, has been promoted to manager of the San Antonio district. O. S. Whitaker, formerly assistant to Mr. Bailey, Dallas, Texas, will replace Mr. Dye at Kansas City.

Praschak Machinery Co., Marshfield, Wis., has announced the development of a new type of concrete and cinder block machine. A. H. Praschak, owner of the company, sold his concrete block plant to S. J. Owen, Minneapolis, Minn., and has entered the concrete block machinery business, and plans to manufacture complete concrete block plants.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., have been appointed distributor of B. & W. electric resistance welded boiler tubes.

Turco Products, Inc., Los Angeles, Chicago and Houston, manufacturers of cleaning and maintenance compounds for every industry, announces that Donald Keating has joined the company as technical service representative.

Nordberg Mfg. Co., Milwaukee, Wis., has appointed R. R. Schultz as assistant sales manager. K. S. Block has been transferred from Milwaukee to the New York office as district manager; G. E. Jarpe has been transferred from Milwaukee to Spokane, Wash., as district manager of the Crusher and Process Machinery Divisions; J. B. Bond and H. N. Propp, sales engineers, have been assigned to the engineering staff at Milwaukee; and T. D. Davis, who was located in Los Angeles, has been appointed district manager of the Southwestern district for both the Crusher and Process Machinery Divisions.

Marmon-Herrington Co., Inc., Indianapolis, Ind., announces that Bert Dingley is retiring as president of the company. He is to be succeeded by David M. Klausmeyer, who has resigned as plant manager of Chevrolet Commercial Body Division of General Motors Corp. to join the organization.

Hercules Powder Co., Wilmington, Del., has appointed Clifford T. Butler as superintendent of the Hercules, Cal., plant, to succeed Leroy P. Hall who has resigned. Eustace St. P. Bellinger, who was Mr. Butler's assistant at the Bessemer, Ala., plant will succeed him there as superintendent.

St. Regis Paper Co., New York, N. Y., has purchased the Florida Pulp & Paper Co., Pensacola, Fla.

Institute of Makers of Explosives, New York, N. Y., announces headquarters of the Institute has moved from 103 Park Ave. to 343 Lexington Ave.

Milwaukee Hydraulics Corp., Milwaukee, Wis., announces the addition to the staff of Don Smith as vice-president and director of sales. He was formerly sales manager of the General Excavator Co.

Lima Locomotive Works, Inc., Lima, Ohio, has appointed the Foulger Equipment Co., Salt Lake City, Utah, as sales agent for Lima Shovels, cranes and draglines in the State of Utah and southwestern Wyoming.

First Machinery Corp., New York, N. Y., formerly of 819-37 E. 9th St., New York, has moved to 157 Hudson St.

Vulcan Iron Works, Wilkes-Barre, Penn., announces the appointment of Thomas H. Fawcett as sales engineer for the Locomotive Division. He was formerly connected with the Baldwin Locomotive Works.

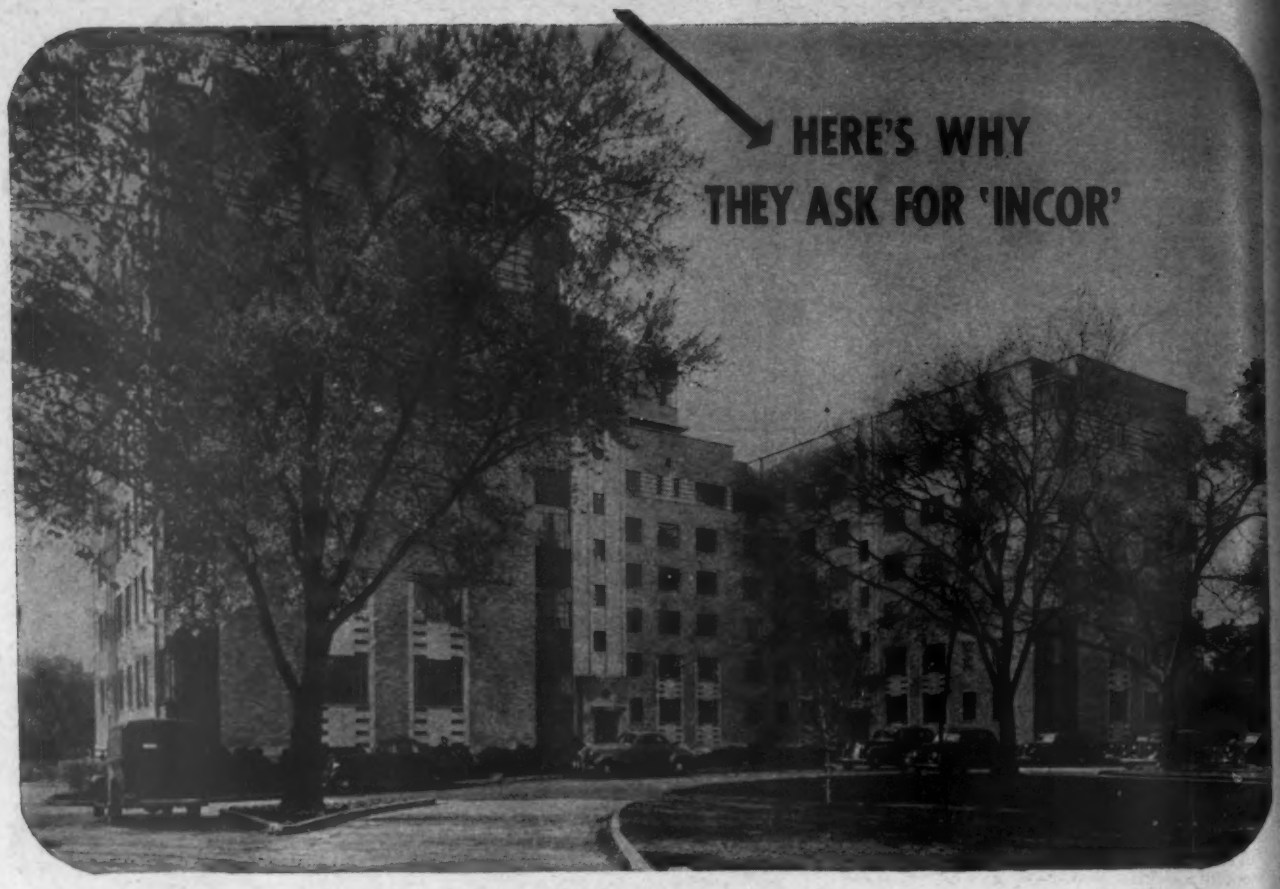
American Chain & Cable Co., Inc., Bridgeport, Conn., has elected A. P. Hall as vice-president of the company. He will continue his present duties as general manager of sales, and his headquarters will remain in New York City.

International Harvester Co., motor truck division, has announced the appointment of W. K. Perkins, former assistant manager of sales, as manager of sales. J. T. Sullivan, former branch manager at Portland, Ore., has been made central district sales manager to succeed W. A. Riggs, who replaces R. R. McDonald as northwest district sales manager. Mr. McDonald has been appointed manager of the newly established branch at Salt Lake City, Utah.

Pioneer Engineering Works, Inc., Minneapolis, Minn., has announced the consolidation of all service activities under Harold E. Rollin, manager of sales engineering.

Link-Belt Co., Chicago, Ill., announces the opening of the following new sales offices: Moline, Ill., in charge of M. J. Parykaza, district sales engineer; Cincinnati, Ohio, with L. B. Clark, district sales engineer, in charge; and Birmingham, Ala., in charge of C. C. Wiley, district sales engineer.

Wickwire Spencer Steel Co., New York, N. Y., has appointed Jerry Sabin, advertising manager of the Colorado division of C. F. & I., as director of advertising for the Colorado Fuel and Iron Corp., all divisions and subsidiaries. He will continue to maintain headquarters in Denver, Colo.



SIX WEEKS' EARLIER OCCUPANCY AT LESS COST WITH 'INCOR'

CONCRETE USERS ask for 'Incor', America's FIRST high early strength Portland cement, for a very tangible reason . . . to get top construction speed at less cost. On Royal York Apartments, Columbus, Ohio, 'Incor' saved one complete form-set and two sets of shoring. Erection time was advanced by six weeks, worth $10,500 in rentals to the owner. And 'Incor' saved the contractor $900 net, when this job was built, in 1937. At TODAY'S peak lumber and labor costs, this 'Incor' saving would amount to at least $2070!

Savings like these make it plain why leading Ready Mix Operators stock 'Incor'* 24-Hour Cement at all times, as part of their good service.

*Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BETHLEHEM, PA. • BIRMINGHAM
BOSTON • CHICAGO • DALLAS • HOUSTON
INDIANAPOLIS • JACKSON, MISS. • KANSAS CITY, MO.
NEW ORLEANS • NEW YORK • NORFOLK
PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25,300,000 BARRELS ANNUAL CAPACITY

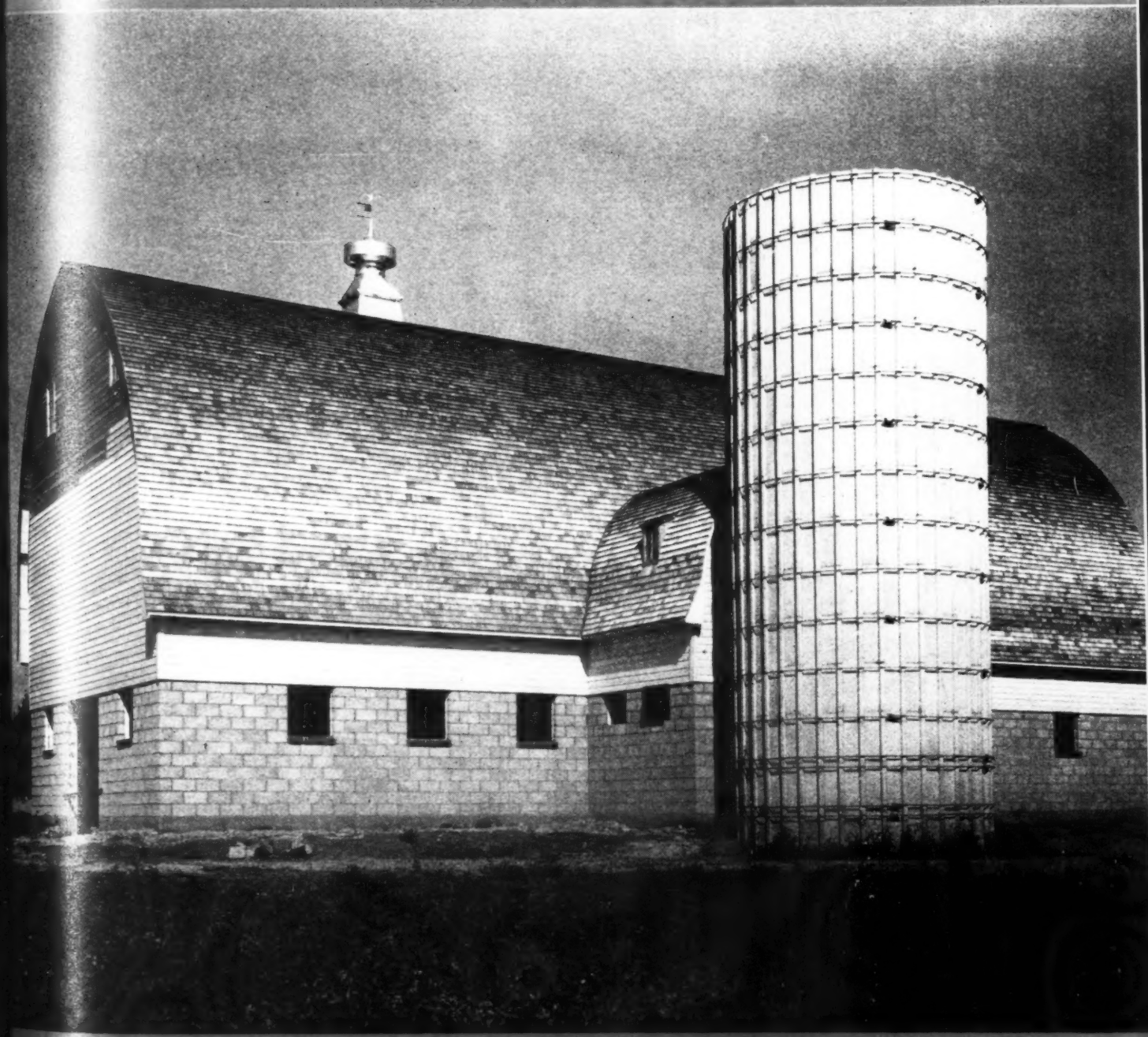
ROCK PRODUCTS'

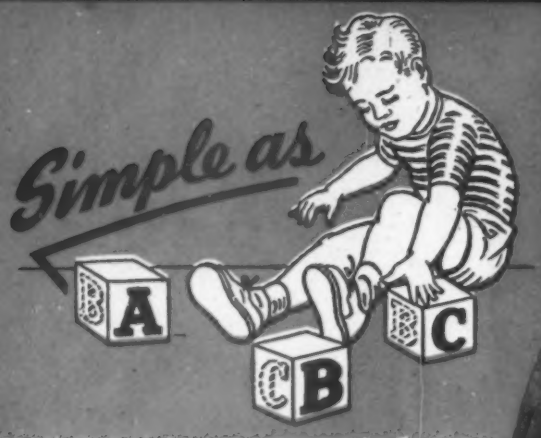
CONCRETE PRODUCTS

and Cement Products

AUGUST
1946

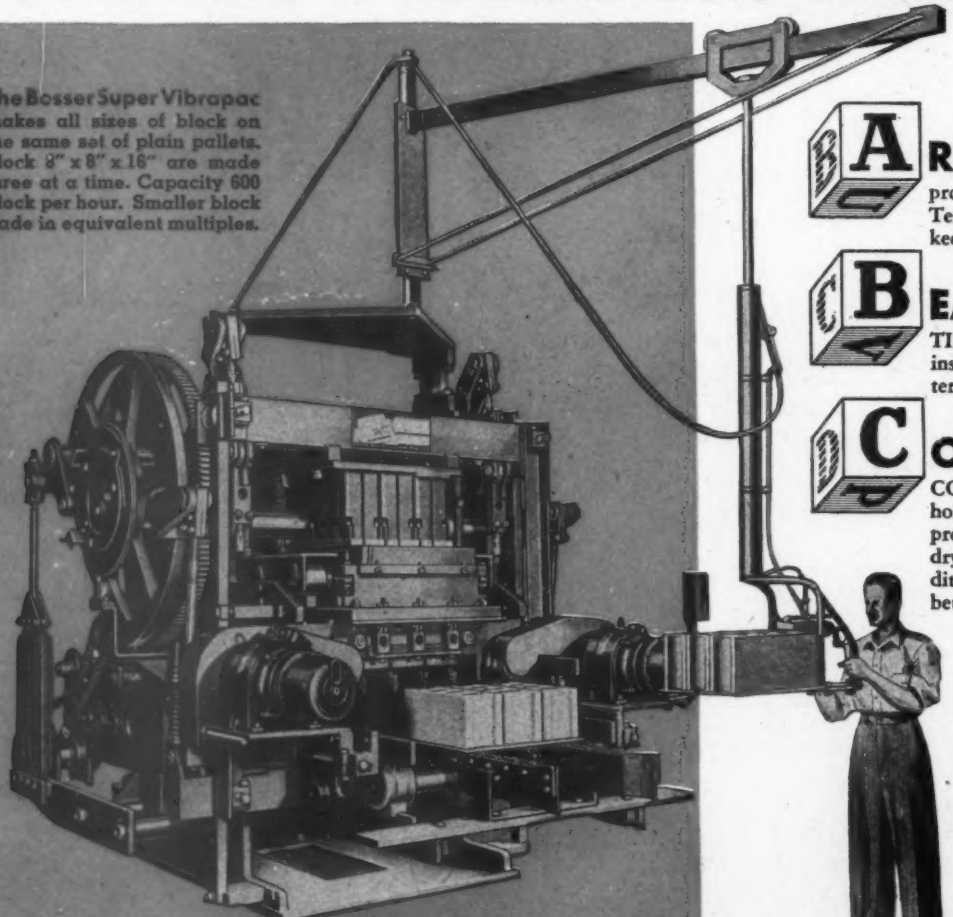
• Concrete block for modern barn supplied by Starbuck Cement Products Co., Starbuck, Minn.





A few of the many attractive concrete masonry designs that add beauty as well as utility.

Why BESSER VIBRAPAC Concrete Block Excels!



The Besser Super Vibrapac makes all sizes of block on the same set of plain pallets. Block 8" x 8" x 16" are made three at a time. Capacity 600 block per hour. Smaller block made in equivalent multiples.

ARMOR Besser Vibrapac Concrete Masonry structures are ARMORED protection against Age, Climate, Fire, Weather, Termites, Rodents, Tornadoes, Hurricanes, Upkeep and Repairs.

BEAUTY Besser Vibrapac Concrete Masonry structures are built in BEAUTIFUL Architectural Designs. Outside walls and inside partitions are made in many pleasing patterns with any desired texture, finish and color.

COMFORT Besser Vibrapac Concrete Masonry structures are COMFORTABLE because walls are made of hollow units or units of cellular material which provide insulation against cold and heat. Wall dryness provides good health and sanitary conditions. Quiet is assured by sound conditioning between rooms and floors.

THE WORLD'S OUTSTANDING CONCRETE BLOCK MACHINES

Besser Super Vibrapacs have long proven their ability to produce quality block at low cost. Check these outstanding features: All sizes and types of block produced on one set of plain pallets ... Fully automatic operation... Automatically controlled pressure and stripper head...Undirectional Vibration...Fully Pressed Top...Flexibility to produce variety of unit sizes and types ...A record of outstanding service in both peacetime and war.

It's Fully Automatic — even including the pallet feeding. No machine operator required. One man offbears full machine production with power hoist. Hand labor is reduced to pressing a switch button and guiding hoist. Write for literature.

BESSER MANUFACTURING CO.

Complete Equipment for Concrete Products Plants

208 FORTY-SIXTH STREET, ALPENA, MICHIGAN, U. S. A.

Measure Out Aggregates With CHUTE

Curtis Block and Supply Co., Tuscaloosa, Alabama, has efficient system of handling aggregates from cars to mixer

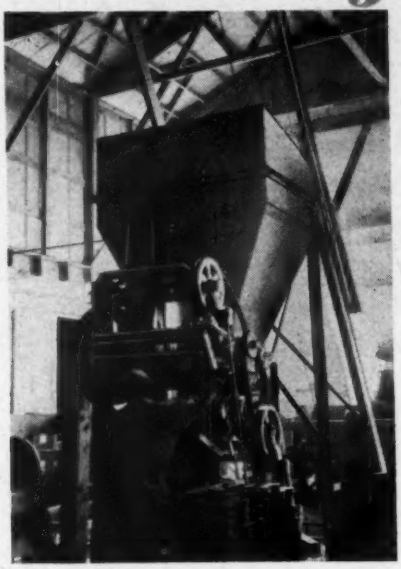
By H. E. SWANSON

MANY of the new concrete products plants springing up all over the country are featuring mechanical methods of operation to effect a saving of labor and to increase operating efficiency. One such feature is emphasized at the Curtis Block and Supply Co., Tuscaloosa, Ala., where aggregates are measured volumetrically by means of a chute from overhead storage bins to the concrete mixer. This plant is new in design and started production in September, 1945.

The chute, shown in one of the illustrations, extends on about a 35-deg. angle from the bin to the mixer and has 2-ft. panels on either side to contain the aggregates. A guide line shows when the chute is filled with the specified amount. It is of all-steel construction with a capacity of 24 cu. ft., and has manual control of gates from the bin and from the discharge end of the chute into the mixer, both controlled by the operator on a platform level with the top of the mixer. Water to the mixer is also controlled by this operator, the only man necessary in the flow of material from railroad cars to bins and into mixer.

Use Lightweight Aggregates

Superock lightweight aggregates, received by rail and dumped into a hopper under a spur track, are moved by a bucket elevator, 42 ft. centers, to the top of a three-compartment Blaw-Knox storage bin. The 105-ton capacity bin has a swivel-chute arrangement at the top to permit flow of aggregate to any of the three compartments. While only the lightweight aggregate is used at present, the three-compartment bin will allow storage of other aggregates, should production of other types of block be desired.



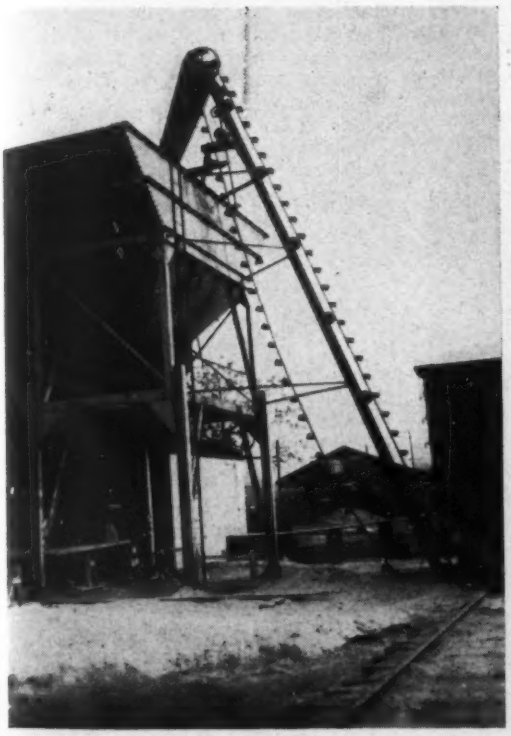
Block machine set up for the production of 2200 units daily

After measurement in the chute, aggregates drop into a 28-cu. ft. Stearns mixer, where water and air-entraining cement are added. According to the superintendent, experience has shown that air-entraining concrete is more workable, and imparts a plasticity to the newly made unit that lessens breakage.

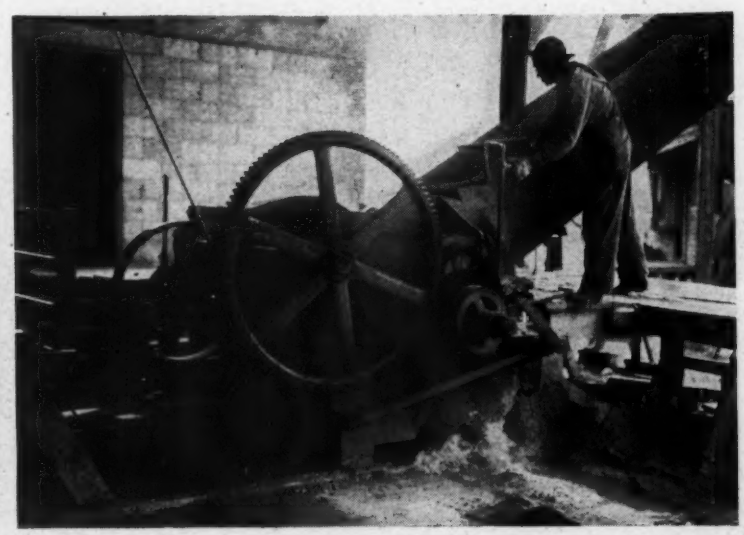
Unusual Curing Room Piping

Concrete from the mixer discharges to a skip hoist which elevates

(Continued on page 194)



Left: Aggregates from track hopper are elevated to three-compartment bin by bucket elevator. Note swivel chute arrangement for loading separate compartments. Below: Chute of 24-cu. ft. capacity measures aggregates by volume before they are released into mixer



Specialties

Lister Concrete Products, Waterloo, Iowa, has built up a big business in precast concrete steps; also manufactures concrete block and garden specialties

By H. E. SWANSON

Lister Concrete Products plant facing street is designed to advertise products. Note samples of precast steps, modernistic treatment of concrete block office, and concrete garden specialties made by company

New Plant Making PRECAST STEPS

MANUFACTURE of precast concrete steps and many other specialty items in addition to concrete masonry units has given Lister Concrete Products, Waterloo, Iowa, a diversified line of concrete products. Precast concrete steps have been produced since 1942, under a license granted the company for the State of Iowa by the Pre-Cast Step Form Co., St. Paul, Minn.

Step Forms

Forms for the steps are made from 1/16-in. plate steel and angles and consist of an inside form and outside form. The steps are cast face down and, in assembly, the riser and treads are bolted to the two side panels, starting from the first riser to the top riser. A special oil of lukewarm temperature is then applied with a soft brush or waste, giving the inner surfaces of the forms an even coating. Any small cracks that may appear at the union of the sides with the lower form are filled with a heavy pump grease. Reinforcing wire mesh of No. 8 wire spaced on 6-in. centers and shaped to fit the steps, is placed in the form. The inside form is then bolted in place.

Unit Is Vibrated

Sand and gravel aggregates and high early strength cement are used in the production of the steps. Proportions as specified by the licensor call for nine shovels of concrete sand and seven shovels of pea gravel to one sack of cement, with sufficient mixing water for a 3-in. slump. Concrete, mixed in a pug mill type mixer, is poured into the forms through a specially designed scoop, 14 in. in width, that provides an even flow into the form, and helps to prevent air bubbles from forming in the narrow spaces between the forms. The 4-step unit is poured in about 12 minutes and is vibrated during the pour and for two minutes afterwards on a company-made vibrating table, with the top of the table flush with the floor level. After casting the unit, four ¼-in. steel rods are placed in either side section as additional reinforcing.

Steps are cast with or without the platform, although the standard unit consists of four steps and a platform. This particular form, called Model B, will cast eight standard units. It comes in four widths, 3-, 4-, 5- and 6-ft., with 7¼-in. risers, 11-in. treads, and a 30-in. platform. The projecting nosing adds one inch to each tread and one inch to the platform. These steps can be arranged on top of one another to give any desired number of steps. They also can be placed side by side to extend the width or back-to-back for a two-way entrance. The side sections are 2 in. thick at the top tapering to 1¼ in. at the bottom, permitting easier removal of the inner form after the unit is cured. Tread and platform thickness is 2 in. and riser thickness is 1½ in.

Left to right: Glenn F. Lister, owner; Henry Ahrenholz, foreman; W. J. Morf, office manager; and Freeman Moser, steel foreman

Curing

After initial set, units are placed on wooden roller platforms by a 2-ton Timken chain-hoist operating on an overhead Lowden track. They are moved to steam curing rooms or are covered with wet burlap for curing. After a 24-hr. curing period, forms are unbolted. The inside form is removed first by the chain hoist. The hoist is then attached to off-center

projections on the sides of the assembly and when lifted the unit is turned through a 180-deg. angle, placing the stripped portion underneath. Side forms are removed and the lower form (which has now been placed on top by inverting the assembly) is removed by the hoist. The unit is now in an upright position on the roller platform. Curing by wet burlap coverings is continued for a period of three days and the units are then removed to storage.

Safety Tread Feature

The outside form, which shapes the tops of the steps and the platform, has regularly-spaced indentations, giving the top of the steps a series of knobs, known as the "Safety Tread," a feature of the unit, and patented by the licensor.

Additional models, under this patent, are provided by the Pre-Cast Step Form Co. They include a model for a plain concrete step; one with a sectional platform on which Model B can be placed in three arrangements; a model for a terrace step; and a special model, made to order only, for an inside apartment stairway.

Steel Hand Rails

Ornamental steel hand railings are also provided for in the license. When the units are cast, nuts are placed in the form at six points so that the steel railing can be securely attached after the concrete unit is completed. The railings are shaped in a special jig provided by the licensor and are made in various ornamental patterns. Joints of the railings are electric-welded at the plant.

Delivery

Delivery is made on two specially designed trailers. The framework of each trailer is constructed of 2-in. steel pipe, electric-welded. It rides on two rubber-tired wheels, and straddles the step. The step is lifted by two hand winches and is locked into place. The trailer, pulled by a truck, may be backed up to the point where the step is to be placed, and the unit can then be lowered into place by the two winches.

Production capacity is four units of four steps each per day. It has been found that two men can strip the forms from the units in 4½ hr. A 4-ft. wide unit weighs 800 lb.; a 5-ft. unit weighs 1000 lb.; and a 6-ft. unit weighs 1200 lb. Tests made on the units show a compressive strength of 4300 p.s.i. in 28 days.

The Pre-Cast Step Form Co. provides steel forms for its licensees as well as a specially designed jig to shape steel railings for the steps, and a specially built trailer for the delivery of the units. Although the steps are usually made in units of four steps and a platform, it is pos-

(Continued on page 196)

Concrete steps are delivered to the job and placed in position with this specially designed trailer made of 3-in. steel tubing. Steps are held in place between tube frame, to the left

Concrete steps on end show how they are cast

Block made on tamper machine are placed on steel racks by pneumatic off-bearer

Selling All-Concrete Farm Buildings

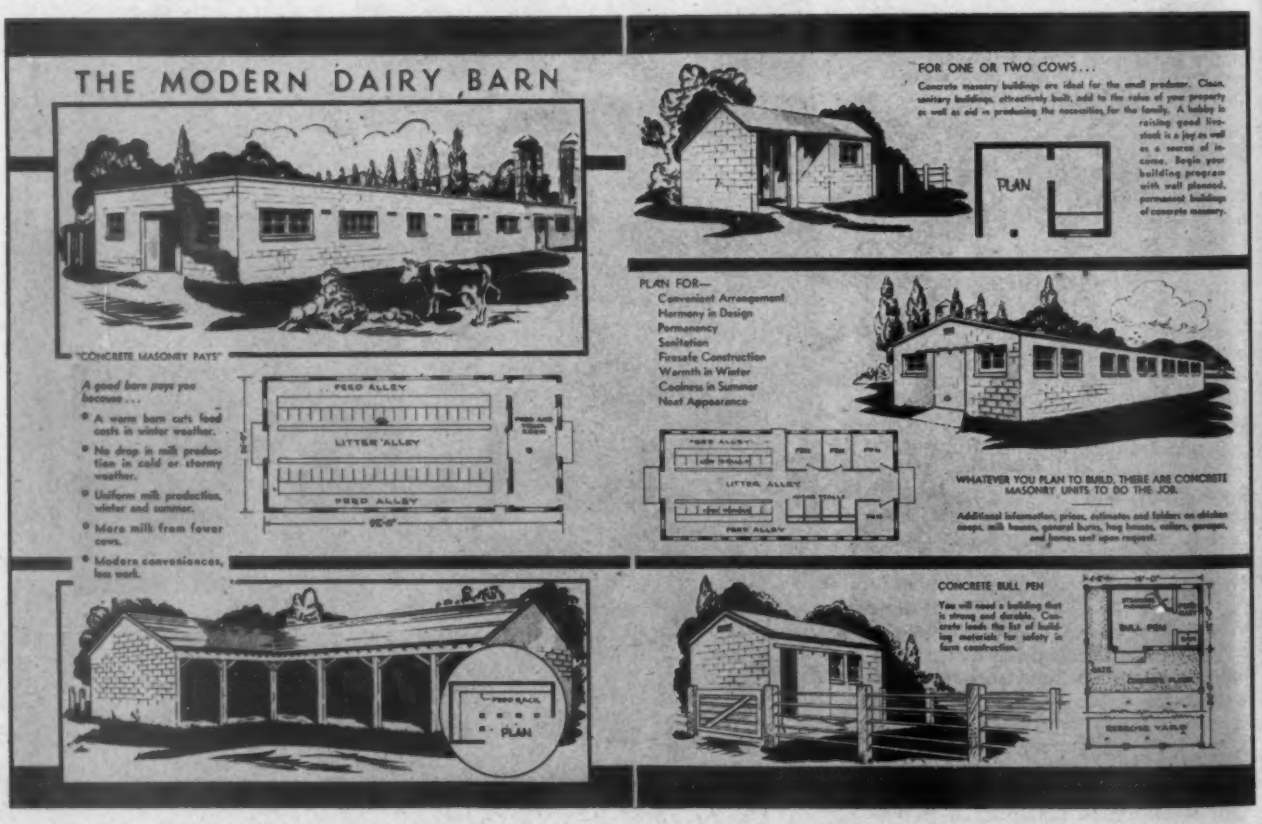
Buehner Cinder Block Co., Salt Lake City, Utah, promotes the construction of all-concrete structures, using precast roof slabs, columns, joists, and block

By RALPH S. TORGERSON

Cover of two-color folder promoting use of concrete in all farm structures

ONE of the most profitable markets for concrete products having great potential possibilities is the farm market. Buehner Cinder Block Co., Salt Lake City, Utah, with years of experience in varied types of precast concrete as well as concrete masonry manufacture, decided that this market justified a well-planned campaign of promotional literature to educate farmers to the advantage of building all-concrete structures.

This company produces in concrete practically every structural part of the farm building, including cinder concrete block for walls and foundation, precast sills and lintels, concrete columns, Lithibar joists, and Channelcrete roof slabs. Floors, mangers, and footings, of course, are of poured concrete, but all the remainder of the construction is of precast concrete sections. Over the roof slabs, a ½-in. rigid insulation board is laid which



Inside pages of two-color folder showing floor plans and sketches of all-concrete dairy farm structures

is given a weather-proof coating of tarred gravel.

Dairy men are particularly enthusiastic about this type of construction. The illustration shows the interior of an all-concrete dairy barn, the owner of which is quoted as follows: "I like my all-concrete dairy barn. It is easy to keep clean and sanitary. I have less trouble with livestock disease. It saves time and worry, for regardless of weather conditions, my stock is comfortable and well cared for. I am using less feed this year and getting more milk from my cows. It is the best way to take care of livestock." He also overlooked mentioning that its permanent construction requires little upkeep and painting, and is infinitely more fire-safe than a wooden building.

Two samples of the attractive and informative literature distributed by Buehner Cinder Block Co. are shown, herewith. Farm homes in concrete as well as buildings for livestock also are depicted. With this literature is enclosed a self-addressed, return postal card on which postage is prepaid so that requests may be made for specific literature and information on the following types of structures: poultry coops, dairy barns, milk houses, all-purpose barns, hog pens, root cellars, better homes, garages, stepping stones, stores, theatres, churches, tourist courts, apartment houses, schools, factories, office buildings, warehouses, all-concrete buildings.

For the convenience of the sender, these subjects are listed on the back of the postal card with a square opposite each so that it is only necessary to place a check indicating the subjects on which information is desired. Below is a line for a subject, "Not listed" above, followed by spaces for name, address, and phone of the writer.

Step Up Block Capacity

CONCRETE PRODUCTS CO., Dubuque, Iowa, has made extensive changes to its concrete masonry unit plant, stepping up production from 1700 to 3500 units daily. Overhead bins have been installed for sand, gravel, and Celocrete aggregates, a new Stearns Model A Clipper Stripper with a 28-cu. ft. mixer and skip loader has been added to assist a Stearns Joltcrete. A bucket elevator has been installed to load the bin. In addition, two new curing rooms have been built to augment the two that handled the production from the first machine. A turntable has been placed at one of the machines to assist in removal of racks from the machine, and off-bearing equipment has been added at both machines. The C. & G. W. R. R. has installed a new spur track adjacent to the plant for delivery of aggregates.

U. S. "Cap" Lewis and W. W. Lewis are co-owners of this plant, which produces both lightweight Celocrete and sand and gravel concrete units on a 50-50 basis.

Interior of all-concrete dairy barn with precast concrete roof slabs, joists, pillars, and concrete block walls and foundation. Poured concrete floors and mangers

Concrete Burial Vaults Recommended Standards

NATIONAL BUREAU OF STANDARDS is distributing for consideration, Recommended Commercial Standard for Concrete Burial Vaults, TS-4111, which was prepared pursuant to a request from the National Concrete Burial Vault Association, Inc. All reports indicate the standard is meeting with general acceptance.

Concrete burial vaults covered by this standard are of the two-piece type, and are made in two weights for interment at not more than 5 ft. and not more than 8 ft., respectively, below ground, measured to the bottom of the grave.

The standard further provides that the finished vault shall be free of cracks and noticeable surface imperfections, and joints shall fit uniformly along their entire length. Vaults shall be considered ready for delivery when 28 days old if made with normal portland cement or when 10 days old if made with high-early-strength cement, or when the average compressive strength of three 3- x 6-in. cylinders cast at the time of casting the vault, from the same concrete and cured in the identical manner as the vault, exceeds 4500 p.s.i. The date of casting and the weight designation (referred to in previous paragraph) shall be permanently marked on the lid or top section of each vault. Details are given in the standard as to the manner of making loading tests. For the 5-ft. interment, 12,000 lbs. total load is required; 8-ft. interment, 20,000 lbs. total load is required.

Portland cement shall meet the requirements of A.S.T.M. Designation C150-44. Fine aggregate shall consist of clean natural sand, or sand prepared from gravel, blast furnace slag, or expanded burned clay, and graded to pass a No. 4 sieve (U. S. Standard) with not less than 10 percent and not more than 30 percent passing a No. 50 sieve. Coarse aggregate shall consist of clean gravel, crushed stone, slag, or other approved inert material graded to pass a ⅜-in. screen with not more than 10 percent passing a No. 4 screen; for wall thicknesses greater than 1½ in., not more than 20 percent may consist of ⅜ to ½-in. size.

Recommended reinforcement shall consist of welded steel wire mesh conforming to the requirements of A.S.T.M. Designation A185-37 with openings not smaller than 2 in. square nor larger than 4 in. square. It shall be so placed that at no point the reinforcement is less than ½ in. from the surface of the concrete. The minimum wall thickness recommended is 1¼ in.

The concrete should be so proportioned as to yield a smooth, workable, non-segregating mix. The total maximum water shall not exceed 5½ gal. per bag of cement. Vibration of concrete in the forms permits placing and compaction of concrete of lower water-cement ratio, and is recommended.

Vaults shall be stored for their curing periods at a temperature of 65 deg. F. or higher. They shall be stored in damp atmosphere (relative humidity of 95 percent or higher) or kept well wetted down. Dry air currents or conditions that cause drying should be avoided.

Block for Airports

BRADLEY AIRPARK CORPORATION, Peoria, Ill., plans to set up a block plant to build 1,000,000 concrete masonry units this year for the company's projected airport buildings.

Cement Dust Case

(Continued from page 179)

case, the Supreme Court said: "That is a nuisance which annoys and disturbs one in the possession of his property, rendering its ordinary use or occupation physically uncomfortable to him. * * * and when the cause of the annoyance and discomfort are (is) continuous, courts of equity will interfere and restrain the nuisance."

In the Orofino case there was no evidence as to the cost of removal of the plant. In the Baltimore and P. R. case cited, after setting out and explaining that permission granted for construction of the plant did not exempt the railway company from liability, the Court further said: "And in this case, if it is not possible to so remodel the engine house and workshop as to prevent the annoyance complained of, they should be removed to some other place, where, by their use, the plaintiff would not be annoyed and disturbed in its enjoyment of its property."

The opinion of the Court was, so far as the expense incurred in installing dust collecting equipment was concerned, that the evidence showed such installation was largely for the benefit of the company itself; such expense and method of installation was governed by the savings to the defendant in raw materials and was a commercial venture rather than a protective measure.

The Findings of Fact corroborated the Memorandum Opinion and it was ordered and decreed "that the defendant, Washington-Idaho Lime Products Co., a corporation, be and it is hereby enjoined and restrained from operating its said cement plant or factory at its present location, in such a manner as to cause or permit the said cement dust or sediment emitting from its smokestack to be carried from said smokestack in the air currents and precipitated upon, in and around the homes of the plaintiffs, J. L. McCarthy and Ed. Gaffney; and said defendant is further enjoined and restrained from operating its said cement factory at its present location in such a manner as to allow or cause the gases or fumes emitting from its smokestack to be carried in the air currents so that the same permeate the air in and around the homes of the plaintiffs, J. L. McCarthy and Ed. Gaffney."

The case was decided in the District Court of the Second Judicial District of the State of Idaho, in and for the County of Clearwater, before Judge A. L. Morgan, Moscow, Idaho, and recorded in Book 3 of Judgments, Page 193.

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OTIS H. WALKER, Junction City, Kan., has opened a concrete block plant at 17th and Monroe Streets, with provision for a ready mixed concrete plant later on.

New Concrete Products Plants

NEW ENTERPRISES for the manufacture of concrete products continue to develop in increasing numbers. News of new and projected plants, according to regions, follows:

Great Plains States

JOHNSON BLOCK CO., Clinton, Iowa, is a new concern which will manufacture ready-mixed concrete and concrete block. According to George A. Johnson, the owner, a minimum of 15 men will be employed in the plant.

MANHATTAN CONCRETE PRODUCTS CO., Manhattan, Kans., has been organized by V. V. Morris, Ronald Johnson, and W. H. Cooper, all of Manhattan.

CHARLES EAGLETON and NEY SERVIS of Socorro, N. Mex., have started production of concrete block in the warehouse of Socorro Hardware Co., Pumice from Cochita, N. Mex., will be used as aggregate.

GEORGE EDWIN POLLOCK, a returned veteran, Trenton, Mo., has started a concrete block plant at 800 E. 13th St. and will manufacture both light and heavy type block. Capacity of the plant will be 1000 block per day, increasing to between 1600 and 2000 block later.

OVA COLLINGS, JR., Bethany, Mo., is completing a plant that will attain production of 1000 concrete block per day. The block machine is a tamper and chats will be used for coarse aggregates.

CARROLLTON MATERIAL CO., Carrollton, Mo., has started the manufacture of concrete block. Alfred Ellet, manager, and Kenneth Goodnight and Robert Haywood are the owners.

J. B. MARCY and his son, J. B., Jr., will start production of concrete block in a new plant located at Blue Rapids, Kans. Mr. Marcy comes from Vermillion, Kans.

MACLAY CONCRETE AND MATERIALS CO., Crystal City, Mo., Harry Maclay owner, has started operation to produce 800 concrete block per day.

W. J. BARRETT, West Plains, Mo., has announced that he will start the manufacture of concrete block with a Kirkham machine at a plant to be located at Ellis Spur on the northern outskirts of the city.

CEMENT PRODUCTS CO., Missouri Valley, Iowa, has a new plant, capacity 1400 units per day, for the manufacture of concrete block. George Culavin and Eugene Heffley are owners.

EARL BEELER has organized the Lay-More Tile Co., and will build a plant at Erie, Kans. An interlocking block will be made.

GENE FOLEY and BENNIE HUGHES, Tonganoxie, Kan., have started a cement block plant that will produce 800 block per day.

BANKS LUMBER CO., Liberty, Mo., has announced the opening of a concrete block plant in Liberty. Frank Creason will be manager of the new plant, which is expected to have a capacity of 3000 8- x 16-in. block per day.

HARRY E. BOSWELL has started production of concrete block at Farmington, Mo.

E. H. CAYLOR, Osawatomie, Kan., is operating a cement block plant at 1009 South Sixth St. Capacity of the plant is 1000 block per day.

M. K. OLSON CONCRETE BLOCK CO., Wamego, Kans., has started operations.

Northern States

WALTER BROWN AND JAKE ABERLE have opened a concrete block plant in Napoleon, N. D.

CARL JACOBSON, Glenwood City, Wis., has started operating a cement block plant at Spring Valley, Wis. Capacity of the plant is 1500 block per day.

JOHN GIBSON AND EDWARD DEVNEY, both returned veterans, are operating concrete block plants in Northfield, Minn. Mr. Gibson has his plant in the gravel pit of his father, W. W. Gibson, one mile north on the Hastings Road, and Mr. Devney has his plant on the farm of his father, Charles Devney, northeast of Northfield.

CASPIAN LUMBER AND FUEL CO., Ironwood, Mich., expects to start manufacture of concrete block on May 1. Sand for the block will be obtained from the company's own gravel plant.

KUBAT & NOVY CONCRETE PRODUCTS CO., Pine City, Minn., has been organized by Albert Kubat, Jr., and George Novy.

JOHN WITMER has started manufacture of block at Park Falls, Wis.

JAKE FIETZEK has opened a concrete block plant at Dousman, Wis. Mr. Fietzek was formerly with Manley Sand Co.

HARLEY ROHLF and SY BRUCHS, Elk River, Minn., have organized a company to make concrete block.

E. H. HICKOK and HOLGER LARSON, Le Roy, Minn., have formed a partnership for the manufacture of concrete block.

Eastern States

ACME CONCRETE PRODUCTS CORP., Westchester, N. Y., has started production of concrete and cinder block, with an anticipated annual production of 500,000 to 600,000 block. James Henry Wood, head of the Westchester Super Service System, Cedar Lane, is president and managing director of the new corporation.

MEDWAY CONCRETE BLOCK CO., Medway, R. I., is the name of a new concern owned by Armand Giroux and William O'Brien. Capacity of the plant will be 2000 concrete block per day.

(Continued on page 192)

Super VIBRATOR CONCRETE BLOCK MACHINE

- Consistent production of High Compressive Strength masonry units are the GEORGE SUPER VIBRATOR'S answer to today's building material requirements.
- Dual Vibration — THE CORES VIBRATE on their own Vibrating mechanism—the MOLD BOX vibrates on its OWN MECHANISM — BOTH Vibrations are SYNCHRONIZED to make better blocks—*FASTER.*
- Independent Mold Box and Core Mounting on Neoprene Absorbers assures Maximum Isolation of vibration, resulting in Minimum Frame Fatigue.
- ADD to this the new PRESS PACK—new standard equipment on all GEORGE SUPER VIBRATORS — resulting blocks are 20% to 30% more dense.
- At Machine Capacity of 300 BLOCKS PER HOUR top quality production can be maintained.
- Sturdy, Rugged, skillfully Engineered Design assures LOW MAINTENANCE COST.
- George Super V CONCRETE BLOCK MACHINES, conveyors, mixers and pallets are honestly built for Efficiency, Economy, Dependability. They meet manufacturers' and users' strictest requirements.

CAPACITY 300 BLOCKS PER HOUR

GEORGE SUPER V

F·C·GEORGE MACHINE CO·

100 S. Westmoreland Drive

ORLANDO FLORIDA

New Block Plants

(Continued from page 190)

BEDFORD CEMENT PRODUCTS CO., Wheeler Road, Lockport, N. Y., was purchased recently by Nolan C. Welch and Leonard Bray, Niagara Falls, N. Y., from Marvin Bedford.

THE DENOYELLES BRICK CO., Haverstraw, N. Y., which began operations more than a century ago, is planning to make concrete brick in a new plant, according to John L. DeNoyelles, present head of the company.

GRAY CONCRETE CO., Baltimore, Md., has a new plant to manufacture concrete brick and pipe at Wilson, N. C., and ALLIED BLOCK CO., has built a plant in the same city to manufacture cinder block.

Midwestern States

OHIO CEMENT PRODUCTS CORP. has started production of a concrete products plant at McDonald, Ohio, near Niles, which will cost about $65,000. Production will be from 10,000 to 12,000 units per day. According to the local report, high pressure steam curing will be used. Frank Forney, Niles, Ohio, is president and treasurer, and William H. Forney is vice-president and assistant secretary and treasurer. Both officers control the Eckman Coal Co., Girard, Ohio.

SHIAWASSEE CONCRETE BLOCK CORPORATION, Owosso, Mich., has been organized by Anthony M. Koziel, 443 Buckingham avenue, Flint, Mich., and his brothers, Stanley, Charles, and John. The company has been capitalized with $20,000 preferred and $30,000 common.

BESTONE, INC., Chardon, Ohio, a subsidiary of Walter C. Best, Inc., has started a concrete block plant on Route 44, just south of Chardon. The plant is turning out 600 block per hour and has a capacity of more than 5000 block per day. The company plans to manufacture concrete floor slabs, window sills, etc., also a white, water-proof cement block.

CLAUDE COWGILL of Arcanum, Ohio, who operates an agricultural limestone plant in Lewisburg, has purchased the Lewisburg Tile and Cement Co., located at the west edge of Lewisburg. Capacity will be 100 block per hour. Mr. Cowgill plans to continue his limestone operations.

COLUMBIA CONCRETE PRODUCTS CO., Toledo, Ohio, has received a permit from the City Building Inspection Department to construct a $20,000 concrete block plant at 2401 Consaul St., as an extension of its plant.

MIAMI BRIKRETE CO., has been incorporated by G. H. Scherer, R. M. Hair and C. F. Hartsock to manufacture concrete block at the site of Ohio Gravel Co., Camp Dennison, near Cincinnati. This is a $50,000 project.

BLUFFTON CEMENT BLOCK CO., Bluffton, Ohio, plans construction of a new plant which will step up production from 300 to 4000 concrete block per day, with two shifts operating daily. Owners and operators of the company are Ben Amstutz and Sons.

OHIO CEMENT PRODUCTS CORP., McDonald, near Youngstown, Ohio, will have a $70,000 plant near the slag piles of the Carnegie-Illinois property, operated by Forney Brothers of Niles and Girard.

Southern States

CHASE & MCGINNIS, INC., Houston, Texas, plans to expand activities and open concrete products plants in Abilene, Amarillo, and Waco, Texas; operating at Houston as the Bayou Concrete Products Co. In Dallas and Fort Worth it will continue to operate as Chase Building Products Co.

CEMENT BLOCK AND TILE FACTORY, E. Emma Ave., Springdale, Ark., is a new concern which will manufacture 8- x 8- x 16-in. cement block and concrete draining tile measuring up to 2 ft. in diameter. Capacity of the plant is 1000 block per day.

B. G. HINES, New Bern, N. C., plans to erect a block plant at Tarboro, N. C., to cost between $75,000 and $100,000.

CONCRETE BLOCK CO., Walterboro, S. C., has been organized by Lucas Padgett, Perry Buckner, and Harvey Fralick as partners. Mr. Padgett will be superintendent. A Gravely block machine is to be installed.

ST. CATHERINE CONCRETE BLOCK CO., Washington, Miss., S. C. Callon manager, has announced the opening of a new concrete block plant with capacity of 2000 to 3000 units daily.

MENA CONCRETE PRODUCTS CO., Mena, Ark., has a new plant for the manufacture of plain or ornamental concrete block, concrete sills, etc.

E AND P BUILDING SUPPLY CO., Pine Bluff, Ark., the first concern to manufacture concrete block in that city, has been started by W. D. England and war veteran Hascal Pearson.

ELIZABETH CITY BRICK CO., Elizabeth City, N. C., has a capacity of 2200 8-in. concrete block a day in its new plant.

CITY BRICK CO., Carrollton, Ga., has started the manufacture of concrete brick. J. L. Grice is proprietor.

CHOATE SUPPLY CO., Atlanta, Ga., has started construction of a block plant at Rogers, Ark. The company also will market roofing, siding, paint and other building materials.

J. T. and R. A. KARNEY and TOM ANDERSON, JR., partners, Covington, Tenn., are opening a concrete block plant on E. Pleasant St. Capacity of the plant is 1000 block per day.

HARLAN MCCLELLAN and JIM KARR HOPKINS have started making block at Ozark, Ark.

Pacific Coast States

COOS BAY TILE CO., North Bend, Ore., is the name of a new concrete block manufacturing company organized by M. J. Krambeal. Concrete building tile, pyramid foundation block, septic tanks and chimneys will be made.

WINLOCK BUILDING BLOCK CO., Winlock, Wash., will start production of concrete and pumice building block as soon as necessary equipment arrives. Various types and sizes of block will be produced. H. L. and L. A. McLeod are the owners.

MODERN MORTARLESS MASONRY CO., located on the Pacific Highway at North Hazel Dell, Wash., near Vancouver, has started operation in a $40,000 plant. W. H. Schuller is general manager.

ALBERT ARMFIELD and CHARLES R. HOUSE have started concrete block manufacturing at Moses Lake, Wash. In addition to block, concrete brick in various colors are being made.

MOSES LAKE CONCRETE PRODUCTS CO., Moses Lake, Wash., has been organized by C. E. Archer and E. C. Gregg of Seattle, Wash.

WHIDBEY MANUFACTURING CO., S. Whidbey, Wash., has opened a plant to manufacture concrete block, septic tanks, brick, tile, flagstones and other concrete products. F. E. Galbreath and Fred Colvin are owners.

BEN REIMER has started the production of concrete block at Dallas, Ore., in buildings formerly occupied by a planing mill.

FRANK FELEZ, Mendota, Calif., with a $14,000 plant, has begun production of pumice tile (brick), with a capacity of 6000 units per day.

WILLIAM E. HUGHES has taken an option on Bellingham, Wash., waterfront property for the purpose of erecting a $40,000 concrete block plant, according to Harry F. Isler, port manager, Bellingham Port Commission.

Rocky Mountain States

CONCRETE PRODUCTS CO., Lewiston, Idaho, reports that considerable progress has been made in the construction of its new plant where both pipe and block will be made. It is later planned to set up a ready mixed concrete plant.

DARRELL BROWN, a returned serviceman, is operating a new cement block plant at Torrington, Wyo. Capacity of the plant is expected to be 1000 block per day.

KEMMERER CONCRETE AND CINDER BLOCK, INC., Kemmerer, Wyo., is the name of a new concrete and cinder block plant owned and operated by Tony Zakotnik and Pat Maher.

IRVIN S. HILTS, Glendive, Mont., has started manufacture of concrete block at Manhattan, Mont.

Curing System

(Continued from page 185)

it to the feed box above a Stearns Clipper - Stripper. Finished units, placed on 48-block capacity wooden racks, are moved to steam curing rooms by two Yale and Towne manual lift trucks. There are six rooms with a total capacity of 2200 standard units.

Steam, provided by a 35-hp. upright boiler operating at 40 p.s.i., flows through a ¾-in. pipe which is reduced to ½-in. as it enters each of the six curing rooms. Pipes are located at an angle along the wall of each room, entering at the floor line and stopping at the ceiling line at the end of the room, to give the maximum length to the single pipe. After overnight curing, racks are moved to outside storage by the lift trucks over concrete-paved runways.

Plant capacity is 2200 standard 8x8x16-in. units daily. Delivery to the local market in Tuscaloosa County is made by local trucking concerns on a contract basis. Although merchandising has been unnecessary due to the huge demand for block, small advertisements were placed in the local papers when the company started production, to acquaint the public with the new concrete block plant.

John C. Curtis, Harry Pritchett, and N. C. Morgan are partners and co-owners in the Curtis Block and Supply Co.

Concrete Products Cover

THE ILLUSTRATION on the Concrete Products section cover of this issue shows a modern barn on the farm of M. R. Malyon near Glenwood, Minn. Starbuck Cement Products Co., Starbuck, Minn., supplied the Celocrete concrete blocks. It also will be noted that silo is constructed of concrete silo units. Emil Larsen, president of the Starbuck Cement Products Co., reports that this barn has resulted in the sale of a number of other concrete buildings on farms in the vicinity.

New Block Plant

CONCRETE MASONRY PRODUCTS CO., Joplin, Mo., is producing about 1000 standard concrete masonry units per day at a new plant equipped with a Miles Tamper. Production of both concrete and cinder units was started in Jan., 1946. C. O. Baldwin and J. L. Greathouse are co-owners.

Move Brick Plant

THE GOULD LORDBERG BRIKCRETE PRODUCTS CO., Cape Girardeau, Mo., has purchased a Brikcrete plant at Poplar Bluff, Mo., and will move the plant to Cape Girardeau, Mo. E. L. Gould will be manager of the plant which will be located at 615 College street, Cape Girardeau, Mo.

THE TRUTH ABOUT AQUELLA . . .

UNTIL now, you've heard about Aquella from everybody but us. First . . . there was Kurt Steel's absorbing article ("Dry Cellars") in the December 15, 1945, issue of Forbes Magazine.

Second . . . there was the condensation of this same article which appeared under the caption "Water Stay Away from My Wall" in the January issue of the Reader's Digest.

Third . . . there was a flood of anonymous letters containing garbled references to a Federal Trade Commission complaint, as well as a copy of a letter dated December 29th, 1945, which purported to have come from the Director of the United States Bureau of Standards.

Why you've not heard from us until now . . .

In the first place, we were far too busy getting out production to meet the nationwide demand for Aquella. Thousands wanted to be Aquella distributors. Thousands wanted to be Aquella dealers and contractors. And many, many thousands more wanted to buy Aquella for homes, institutions, and factories. Aquella had captured the public's imagination overnight.

Furthermore, at first we thought that this anonymous attack was just the work of some small, misguided competitor. Then, when the vast extent of the campaign became apparent, we conducted an investigation into the source and motives behind the attack.

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."

The Bureau of Standards never intended to discredit Aquella

On December 29, 1945, an unsigned letter came from the office of the United States Bureau of Standards written to Forbes Magazine and the Reader's Digest, protesting the publication of Mr. Steel's article.

After the Director of the Bureau was informed this letter was being reproduced and circulated by the hundreds of thousands for the purpose of disparaging Aquella, the Bureau refused to permit further public distribution of copies.

What the Bureau then did was to write *other letters* stating that the communication of December 29, 1945, was not intended to discredit Aquella.

Nevertheless, thousands of copies of that early letter still continued to be circulated through "mysterious sources."

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."

The Controversy over "Waterproofing" before the Federal Trade Commission

For sometime back there has been a controversy between the Federal Trade Commission and the waterproofing-industry-at-large concerning the use of the word "waterproof" in advertising. What it boils down to is a definition of the word "waterproof" and not any misstatement of fact. Members of the Commission have their definition; those in the waterproofing industry have theirs. The maker of Aquella was only one of many firms that were cited on the issue.

This issue was raised almost a year ago and a complete answer was promptly filed. No further action was taken.

In the meantime, however, there emanated from the same "mysterious sources," thousands of notices of the Commission's citation—with the dateline conspicuously omitted.

The complete details and documentary evidence are to be found in our brochure "The Truth About Aquella."

Now about AQUELLA itself!

From the time it proved itself on the French Maginot Line, Aquella has demonstrated its effectiveness against moisture and seepage in thousands of instances, in various types of masonry construction. There is no single instance where Aquella has ever failed *when properly applied!*

Further, we are continuing permeability tests under hydrostatic pressures which far exceed any that were ever used on Aquella by the Bureau of Standards.

Complete Documentary Evidence for you!

We have prepared a fully documented brochure which contains the complete story of Aquella.

If you are in the waterproofing industry . . . if you sell waterproofing . . . if you are counseling customers or clients on waterproofing . . . or if you are a buyer of waterproofing materials, you owe it to yourself to know the truth!

A copy of this brochure is yours for the asking. Simply write us on your letterhead.

PRIMA PRODUCTS, INC.

NATIONAL DISTRIBUTORS

Dept. A5, 10 East 40th Street, New York 16, New York

Making Precast Steps

(Continued from page 187)

sible to make any number from one to four steps and a platform since the forms are made in single-step sections and bolted together according to the number of steps desired.

Concrete Block

Sand and gravel block are also produced by Lister Concrete Products. Aggregates, measured in a skip loader volumetrically, are elevated to a 25-cu. ft. Besser mixer, where high early strength cement and water are added. The concrete is delivered by gravity to the hopper of a K-3 Besser tamper machine. Block are removed from the machine by an off-bearer and placed on steel racks with a capacity of 45 standard units per rack. Racks are moved to steam curing rooms by an Erickson standard high lift fork-type truck. Block are cured in four 500-standard-unit-capacity rooms, steam being introduced at 10 p.s.i. through a 2-in. pipe, reducing to 1-in. perforated pipes, one for each room. Steam is provided by a 25-hp. Lidgerwood upright boiler. Temperature of 160 deg. is maintained during the curing period. After curing, units are removed to the storage yard by the lift truck. Delivery is made by two trucks, an International and a Dodge, each capable of hauling 300 units per load.

An interesting feature of the plant setup is that it is located alongside a hill, allowing gravity operation. Aggregates are dumped from trucks at street level into four bins, two for the block plant and two for the concrete step plant. Gravity discharge from the bins is directly into the plant or into the skip loader of the block machine.

Among the other specialty items produced are precast concrete septic tanks, which are approved by the City of Waterloo Health Department for use as sanitary disposal tanks for private homes not near the city sewage lines. Tanks are cast 3 ft. high and are made in 24- and 30-in. diameters. Wall thickness for the 24-in. unit is 2 in., and for the 30-in. unit is 2⅝ in. Four of the individual chambers are needed to make up one septic tank unit. Although no reinforcing is placed in the units, the lids are reinforced with No. 8 mesh wire spaced at 6-in. centers. Lids are cast 2½ in. thick and the diameter of the tank. Four units per day are produced.

Precast concrete copings and lintels for 8- x 12-in. walls are also produced in ornamental and plain designs. Other specialty items include precast vases, urns, lawn benches, bird baths, sundials, hog troughs, pier blocks, chimney caps, and stepping stones.

Glenn F. Lister, owner of the Lister Concrete Products, plans to manufacture concrete steps at new plants in Des Moines and Fort Dodge, Iowa, this year.

Florida Block Producers Organize Association

FLORIDA CONCRETE PRODUCTS ASSOCIATION has been organized with temporary headquarters at 2613 Fourth avenue, Tampa, Fla. Officers are as follows: President, J. L. Hart, Hart Concrete Products Co., Tampa; vice-president, Ted Clarkson, Dunbrik Co., St. Petersburg; treasurer, H. R. Brengle, Brengle Brothers, Tampa; and secretary, Malcolm E. Boon, Hart Concrete Products Co., Tampa. Members present at the organization meeting included: J. A. Christ, Arcardia; Henry R. Singeltary and C. S. Needham, Bradenton; W. W. Blackburn, Clearwater; Mrs. E. C. Donnan, Lakeland; Wm. J. Burke, San Antonio; C. Wilder and J. W. Hallowell, Sarasota; Fred Poe, R. L. Cinton, Sr., R. L. Clinton, Jr., J. L. Hart, F. A. Wright, Malcolm E. Boon, and Fred Dobalt, Tampa.

Oregon Plant Expands

OREGON PORTLAND CEMENT CO., Portland, Ore., has announced that $1,000,000 will be expended on an expansion program at its Oswego plant. When completed, the enlarged plant will have a daily output of 3000 bbl., as compared with its present capacity of 1150 bbl., according to President Frank E. McCaslin. Improvements will include a 287-ft. kiln along with additional crushing and grinding facilities and a new dust collector system.

Pipe Convention to St. Louis

AMERICAN CONCRETE PIPE ASSOCIATION, Chicago, Ill., has announced through Howard F. Peckworth, managing director, that the 1947 convention will be held in St. Louis, Mo., early next year. Ray Foley of Gifford-Hill Co., Dallas, Texas, is chairman of the Entertainment Committee.

Purchase Block Concern

ADRIAN CONCRETE PRODUCTS CO., Adrian, Mich., has purchased the Willbee-Morse Concrete Co. and will continue the manufacture of concrete block, burial vaults, septic tanks, lawn furniture and other items. Officers are Charles T. Campbell, president and treasurer; John H. Dana, vice-president; and Mrs. Ruth Campbell, secretary. Oscar Morse will remain as manager, and the old company name will be retained as a division of the Adrian Concrete Products Co. Present capacity of the plant is 4000 block per day in two shifts, with an anticipated capacity of 9000 block per day in one shift.

PROFIT POINTERS for Concrete Block Makers!

Built to Last

APPLEY "Little Giant" Vibrator

8 Block Sizes

The APPLEY "LITTLE GIANT" Vibrator's compact, rugged construction survives the challenge of hard, every-hour production.

Precision machining and expert assembly guarantee smooth, easy, LOW-COST action and speedy production. The "LITTLE GIANT" turns out from 100 to 120 large 8"x8"x16" blocks per hour, frequently more.

The "LITTLE GIANT" is the logical, ideal machine to buy NOW as permanent replacement for old machines frayed and broken in the war-time rush. The "LITTLE GIANT" does away with waste—it's a PROFIT-PRODUCER!

Eight sizes of blocks are moulded day after day in this profit-producing machine. Its mould box forms perfect, uniform-density-blocks with an action of SIX THOUSAND MECHANICAL VIBRATIONS PER MINUTE. Vibrating mould box and stationary, interchangeable cores assure perfectly cut, smoothly faced blocks. Block size change-over is simple, quick.

Precision made, the "LITTLE GIANT" is of cast iron and steel; has absolute minimum of wearing parts. Mould box lined with manganese steel to balk abrasion. Minimum time loss, too, from changing parts, cores.

J. W. APPLEY & SON, Inc.

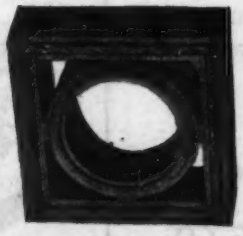
831 NINTH STREET NORTH — ST. PETERSBURG 4, FLORIDA

FIRE PROOF FLUE CONSTRUCTION is a *Profitable Market* . . . get into it by selling MULTIPLEX FLUE BLOCKS

Many concrete products manufacturers are finding Multiplex Flue Block their most profitable line. Are you missing out on these extra profits? Get ready now for the housing boom!

Multiplex Flue Block Machines make ventilated, solid or lightweight units, including all attachments for ventilator and stove pipe openings. Write for literature.

This Model E Machine makes 16"x16" ventilated flue blocks and has attachments for making ventilator and stove pipe openings. Machine includes 1 pallet, 1 set of 6" and 7" forms for pipe openings. Size of flue can be 8½" for round concrete liner or 10½" for round vitrified liner.



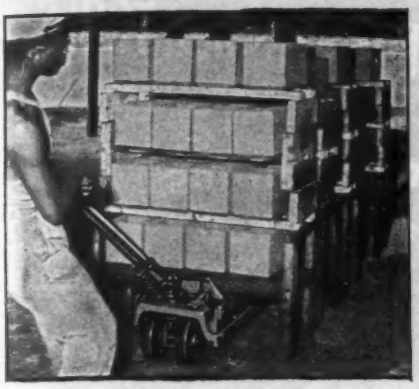
16" x 16" round hole ventilated block

MULTIPLEX CONCRETE MACHINERY COMPANY

ELMORE, OHIO

Specializing in Satisfactory Service Since 1906

Hydromatic LIFT TRUCKS



Speed Handling

Reduce Breakage

at Holloway Concrete Products Co.

Like many concrete products manufacturers, Holloway Concrete Products Company, Winter Haven, Fla., has cut handling costs by using the Hydromatic. This lift truck has a new type ram, easy rolling ball-bearing wheels, and automatic lifting engagement and automatic release . . . insuring speedy and safe handling of loads up to 8000 lbs. The Hydromatic is a multiple stroke, all steel constructed truck, with parts standardized and interchangeable for low cost operation. Write for detailed information and Folder "J."

The Red Arrow
The Hydromatic
Easy single or multi-stroke hand lift truck. Capacities up to 8000 lbs. Users state they pay for themselves 5 to 10 times yearly.

LIFT TRUCKS, INC.
Walter Stuebing, *President*
2425 Spring Grove Ave. Cincinnati 14, Ohio

$1,050

EDGAR VIBRA-SHAKER BLOCK & TILE MACHINE

- 14-day shipment
- 2,000 blocks per shift
- Cast aluminum block & tile pallets available
- We also supply mixers, conveyors, water control units and hopper

Casts two concrete block or partition tile in one operation with a production up to 2,000 units per day. Husky, built to perform. All moving parts pressure lubricated. The Edgar will be shipped to you within two weeks of receipt of order. Price is $1,050 with partition tile changeover (optional) $100 addition. 20% deposit required.

Write for information.

EDGAR'S BLOCK MACHINE WORKS
ORMOND, FLA.
Agent for mixers and conveyers

Any House is a Better House
WITH
CONCRETE FLOORS

Any house, whether built of concrete, brick or frame, can have the advantages of a firesafe, sagproof concrete subfloor. And nothing that a contractor can build into *a house of any material* will give the owner more in firesafety, structural stability and security or contribute more to durability, low maintenance expense, *low annual cost.*

Conserve Scarce Materials

Use of concrete for walls, floors and partitions and cement-asbestos for roofs will help conserve other building materials which are in limited supply and thus permit a larger volume of urgently needed housing to get under way without delay.

Tell Your Customers

The fact that concrete materials are readily available will interest prospective home builders, business men, industrial plant engineers, farmers and others in every community. Advertise this fact to your customers now in every possible way.

Literature containing helpful suggestions on advantages of concrete for home, industrial and farm construction is available on request. Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION
Dept. 8-45, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Built to Insure Rock-Bottom Costs for Drilling and Handling!

"SUBWAY" ALL-SYNPLASTIC AIR HOSE

Balanced construction provides equal service life from tube carcass and cover. A Goodall "Standard of Quality" product . . . a promise of long, reliable use under severest conditions. Sizes ½" to 1¼", maximum lengths of 50 feet.

"TRIPLE-S" CONVEYOR BELTING

Another in the "Standard of Quality" group, made to specifications that assure lasting service on the longest, heaviest hauls. Used for carrying ores, crushed limestone up to 8", rough slag, hot materials, etc.

The Goodall line includes other grades of air hose and conveyor belting; steam, water, suction and discharge hose; transmission and elevator belting; waterproof boots and clothing . . . "Engineered to Your Job."

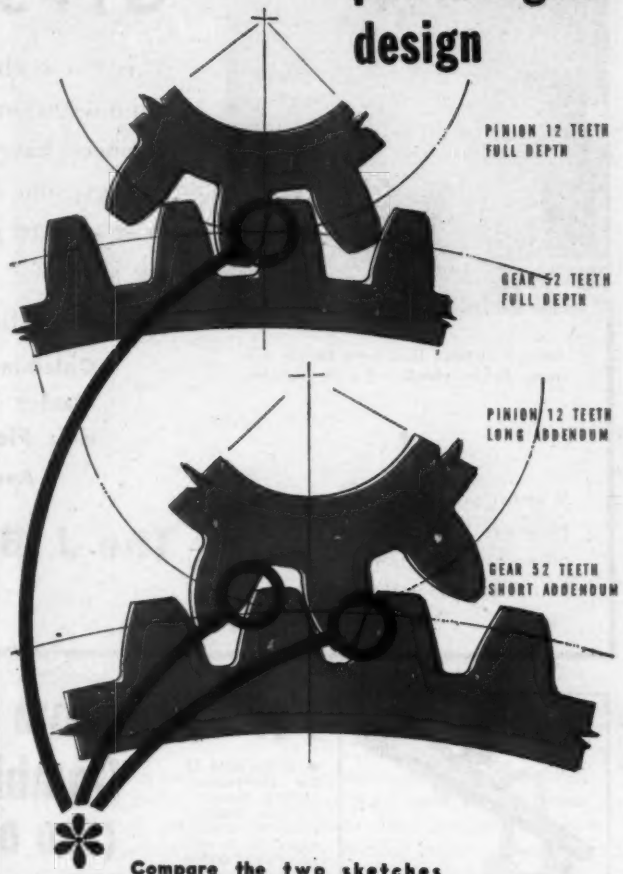
Contact Our Nearest Branch or Main Office for Details

GOODALL
RUBBER COMPANY INCORPORATED

THE GOODALL-WHITEHEAD COMPANIES
Philadelphia • Trenton • New York • Chicago
Pittsburgh • Boston • Los Angeles • San Francisco • Seattle • Salt Lake City • Houston

Factory—Trenton, N. J. Established 1870

for gear efficiency use Stroh 20 deg. pinion & gear design



Compare the two sketches above and see for yourself the advantages of 20 deg. gear design over the standard 15 deg. design. Notice involute teeth with short addendum teeth on gear and long addendum on pinion come in contact earlier and stay in contact longer. Notice also that teeth are stronger because of wider base.

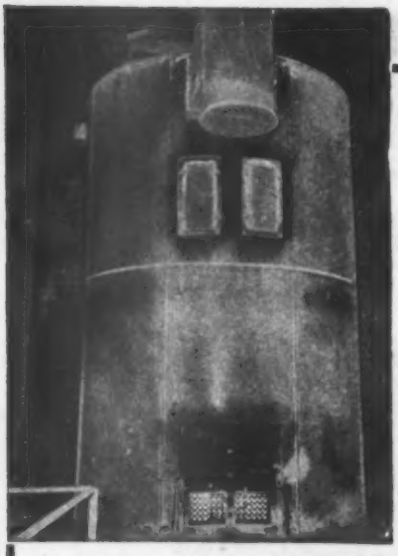
Check these advantages and see how they apply to your plant. (1) Stronger teeth. (2) More tooth surface to resist wear. (3) Smoother running with less tooth chatter. (4) Less danger of tooth breakage. (5) Less pounding on bearings. (6) Less power needed to operate drive. (7) Longer wearing life.

Gears available in either standard design or 20 deg. design cast by the Stroh wear-resistant process with hard, wear-resistant surface and softer, cushioning core. Write for gear catalogue telling the whole gear story.

We also specialize in Trunnion Rollers, Sheaves, Kiln Tires, Crusher Rolls and Jaw Plates.

Stroh Process Steel Co.

1428 HIGH STREET, N. S.
PITTSBURGH 12, PENNA.



Above is pictured the 17-ton Ehrsam Calcining Kettle, standard for the industry.

•

Whether you are planning a complete new plant or need just one piece of equipment, write to Ehrsam for reliable engineering information.

EHRSAM LEADS IN GYPSUM MACHINERY

This 17-ton Ehrsam Calcining Kettle is just one member of the famous Ehrsam line of Gypsum processing equipment. Ehrsam engineers have designed the entire line for economical, trouble-free gypsum and wallboard manufacture. Many of today's most modern gypsum practices originated with our engineering staff.

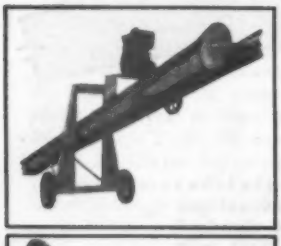
The Ehrsam line includes:

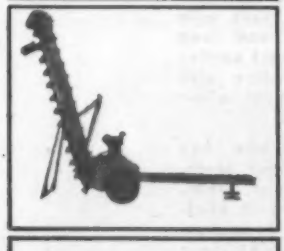
Calcining Kettles — **Buhr Mills**
Plaster Mixers — **Wallboard Equipment**
Hair Pickers — **Crushers**

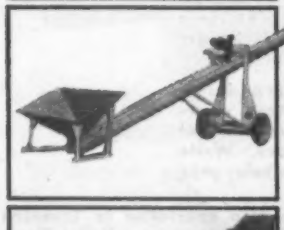
And allied equipment and accessories

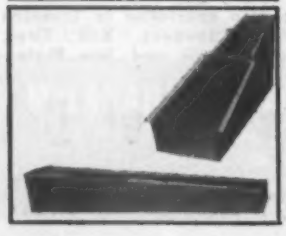
The J. B. Ehrsam & Sons Mfg. Co.

Enterprise, Kansas









For "Freedom of Action"--BAUGHMAN L&M Combination Car Unloader

(180 Degree Conveyor and Piler)

• **Model ASM-2B Car Unloader.** (With Belt). Portable, versatile—all the advantages of a belt conveyor and a chain conveyor with none of the limitations of either. Built for years of service.

• **Model ASL-2B Car Unloader.** (With Belt). Handles 30 - 60 tons per hour . . . lime, stoker and nut coal, sand, chips, cinders, etc. Requires no pit.

• **Model Q Screw Conveyor.** For high-speed loading or unloading of cement, powdered lime or any other material that rolls or becomes liquid in movement. Precision built.

• Under Track Pits for all conveyors. (Above) for Model ASM-2B. (Below) for L & M combination. Easily and quickly installed.

Here is a truly versatile set up! A horizontal unit (individually driven) to elevate material from under the *full width of the car* to the second unit—a 30-foot portable elevating conveyor, which can be moved to discharge in a full half circle, about 90 feet long.

Easily handles large volumes of sand, crushed stone, coal, limestone, etc. Abrasive-resistant belt for positive, "anti-jam" carrying . . . chain drive for positive starting. Ruggedly constructed of high-tensile alloy steel . . . dependable ball and roller bearings throughout.

Write for complete information and prices.

manufactured exclusively by

BAUGHMAN MANUFACTURING CO., Inc.

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LIMA ADVANTAGES PAY EXTRA DIVIDENDS . . .

The LIMA PAYMASTER, because of its high output, excellent performance and low-cost operation, is making new friends wherever it goes. Even beyond field records, the acid test of detailed comparison places the PAYMASTER at the top of the list in modern engineering, features and construction.

Listed below are a few of the advantages you get when you buy a LIMA PAYMASTER:

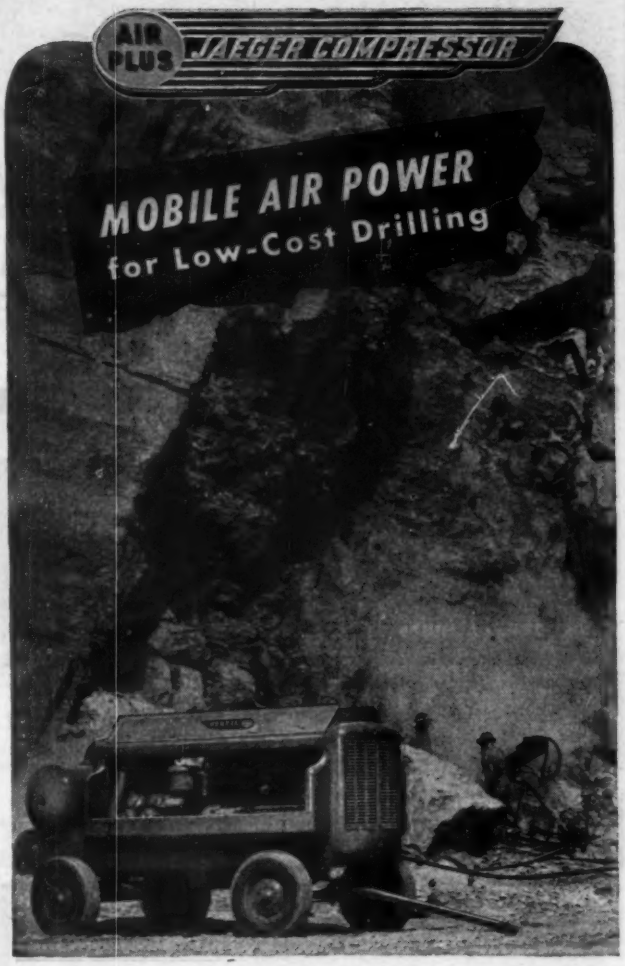
WELDED, BOX-TYPE BOOM
TUBULAR DIPPER HANDLE
ANTI-FRICTION BEARINGS THROUGHOUT
SQUARE LEVER SHAFTS
HOOK CONE ROLLERS
INDEPENDENT BOOM HOIST
SILENT CHAIN POWER TAKE-OFF
CHAIN OR CABLE CROWD
EASE OF CONVERTIBILITY
FAST MOBILE CRAWLER TRUCK

Write today for a copy of bulletin No. 034C which illustrates and describes the LIMA PAYMASTER

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division **Lima, Ohio**
OFFICES IN PRINCIPAL CITIES

SHOVELS CRANES
DRAGLINES PULL-SHOVELS

LIMA



Out where new drilling begins, operators are often finding that the quick, economical way to get there is with Jaeger air-cooled portable compressors. Their rugged, modern trailer mounting (structurally welded frame, spring suspension, Timken bearings, big pneumatic tires, automotive steering) safely takes them wherever trucks can travel. Provides mobility and flexibility of air supply with a range of sizes up to 500 cu. ft. of free air per minute (ample for two wagon drills, as many as 9 rock drills), delivered at cooler temperatures and less cost for fuel and upkeep than you have ever thought possible.

Jaeger "AIR PLUS" Compressors are not to be confused with old-type portables. They are unit-engineered, precision built and balanced machines, with full force feed lubrication, 75% to 100% bigger valves, 20% to 30% slower piston speeds, 100% efficient air intercooling and 30% to 50% larger air receivers.

Latest Caterpillar, International and Continental engines supply dependable power. Sold and serviced in over 100 cities. Send for Catalog JC-5.

THE JAEGER MACHINE CO.
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AIR COMPRESSORS, MIXERS, PUMPS, HOISTS, PAVING MACHINERY, TRUCK MIXERS — DISTRIBUTORS IN 120 CITIES

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Single insertion rate $8 per column inch. Larger insertions accepted at lower rates; request classified rate card. Terms: Cash with order except for contract advertisers who are billed monthly at contract rates. *POSITIONS WANTED and POSITIONS VACANT (not displayed ads) $1 a column inch per insertion; cash with order.*

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1. Gas Producer Building complete with coal crusher, elevator, conveyors, boiler and producer.
2. Slurry machine complete with diluting tank, pump, Kent mixer, Fuller feeder with variable speed drive and Clarkson reagent feeder.
3. Broughton mixer and elevator.

VERMARCO LIME COMPANY
West Rutland, Vermont

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30 ton, Davenport Locomotive, Gas-elec.
20 ton, Plymouth Locomotive, Gas
Shovel attach. for 41B Bucyrus-Erie
10 ton, Buf-Spr. Roller, Gas, 3-wheel
Shovel attach. Northwest, Model 104
McK-Terry Pile Hammer, No. 3
25 ton Browning Locomotive Crane
35 ton, McMyler Locomotive Crane
1 yd. Page Dragline Bucket
Model 4, Keystone Skimmer, Gasoline

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AG DUST OUTFIT

1—Pulverizing Plant w/ Gruendler 3XB, Seco 3x8 Screen, LeRoi power, reciprocating feeder, discharge conveyor, gravity screen, mounted 2-axle chassis, pneumatics
1—Barber-Greene 18"x55' Portable Conveyor
1—Barber-Greene 16"x50' Portable Conveyor
1—Koehring "303" ¾ yd. Shovel-Dragline. For sale as a unit only—August 15 delivery.

EIGHMY EQUIPMENT COMPANY
526 West State Street Rockford, Illinois

FOR SALE

2—Plymouth Gasoline Locomotives, type 2, Model CL, Nos. 1170 and 1171, Gauge 48", weight 3½ ton, with 4-cyl. Buda engine, Model CTU, B/M 1813, Serials 30988 and 30820. Extra wheels, axles, bearings, friction rings, and misel. spare parts.

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You'll never be "put out" when you use E.C.A. REBUILT Equipment. We SELL or RENT on a guarantee basis.

STIFF LEG DERRICKS

1—62½-ton Insley Derrick, 54' mast, 70' boom, 70'6" stiffiegs, 16' bullwheel, complete with 100 HP double drum Lidgerwood electric Hoist No. 1142, 100 HP AC motor and controls. Capacity 10,000 lb. L. P. at 200 FPM.
1—40-ton American Terry Derrick, mast 60', boom 120', sills 47'6", legs 42'4", 18' bullwheel, with 125 HP Derrick & Hoist Co. double drum Hoist with attached swinger. Each drum geared to separate 125 HP G. E. motors 440/60/3 with 30 HP motor geared to swinger. Capacity 15,000 lb. L. P. at 200 FPM. Complete with all control equipment. This unit in perfect condition.

AIR COMPRESSORS

Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. to 1,000 cu. ft.

CRUSHERS

1—Acme Style D 20½ Jaw Crusher, with screen, elevator and gas eng., 13 to 18 tons per hour.
1—9½x24" United Iron Works Jaw Crusher.
1—12x20" Acme Road Machinery's Jaw Crusher, Ser. No. 1873, Style A.
1—9x16" Climax Jaw Crusher #2.
1—9x16" Acme Jaw Crusher #1686, size 8½A.
1—9x18" Sawyer Massey Jaw Crusher.
1—#5 Allis Chalmers Gyratory Crusher, No. 5331, size 10x38".
1—#5 Austin Gyratory Crusher, Ser. No. 2945, size 12x35½".

DERRICKS

4—Steel guy derricks. 2—20 ton American steel guy derricks, 110' masts, 90-100' booms. 1—15 ton American steel derrick, 85' mast, 75' boom. 1—5 ton Terry Guy Derrick, 70' mast, 60' boom.
18—Stiff leg derricks. 16—30 ton Wiley, 30' mast, 60' boom. 1—15 ton Clyde, 30' mast, 45' boom. 1—15 ton derrick, 25' mast, 90' boom.

HOISTS (Electric, Gas, Steam)

85—Electric, ranging from 30 H.P. up to 125 H.P. consisting of triple-drum, double-drum and single drum, with AC or DC motors, some with attached swingers. Following makes: American, Clyde, Lambert, Lidgerwood and National.
Gas hoists ranging from 8 to 120 H.P., single, double and triple-drum all standard makes (38 in stock).
Steam, ranging from 8 H.P. to 60 H.P., single, double and triple-drum; all standard makes.

PNEUMATIC TOOLS
Column Drifters and Tripods

4—Model 17 Denver rock drills.
3—Sullivan high-speed drills, Model FG-3.
5—Ingersoll Rand type X71 drifters.
4—Gardner Denver drills with drifter mountings.

JACKHAMMERS

8—Jackhammers, consisting of Hardsoco, Worthington and Cleveland. 45 lb. and 85 lb. class.
4—Ingersoll Rand Model BCR-430 jackhammers, 47½ lb.
1—No. 3 Hardsoco 50 lb.

WAGON DRILLS

2—Gardner Denver derrick drills with Model 21 Gardner Denver drill; will drill 30 ft.
1—Ingersoll Rand drill, size D, with utility air hoist and Ingersoll Rand X71 drill.
1—Ingersoll Rand Model FM-2 drill, with Ingersoll Rand air hoist, size X71 drill, mounted on pneumatic tires; will handle 20 ft. steels.
2—Ingersoll Rand, Model FM-2, with air hoist and IX71 drill, mounted on 3 steel wheels; will handle 20 ft. steels.
1—Ingersoll Rand drill No. 3122, with X71 drill, mounted on 4-wheel trucks; will drill up to 36 ft. deep holes.

WE ALSO HAVE A LARGE STOCK OF DRILL STEEL WITH MISCELLANEOUS TIMKEN BITS.

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We have a large stock of centrifugal pumps, gas and elec. powered from 1½" to 10". Also Dredging and vertical pumps.

PARTIAL LIST ONLY—SEND FOR 64-PAGE STOCK LIST
All this equipment is owned by us and may be inspected at one of our plants.
WE BUY — REBUILD — SELL AND RENT

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1 only sand lime brick high pressure steaming cylinder, size 6' dia. x 50' long with bolted end for 125 lb. working pressure, 30 gauge track.

THE ATLAS LIME COMPANY, INC.
El Paso, Texas

SCRAPER WAGON AND TRACTOR

Allis-Chalmers Model L Tractor and Garwood scraper, towed type, hydraulic operated, 12 cu. yd. capacity, model 400—4 tires 14:00x20, 2 tires 13:50x20—tires in very good condition.
For complete information and location write to:

JESSE S. MORIE & SON
Mauricetown, N. J.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C., for sale at Attractive Prices. Large Stock. New and Rebuilt. All fully guaranteed. Send us your Inquiries.

V. M. NUSSBAUM & CO.
FORT WAYNE, IND.

FOR SALE

Dixie No. 2424 Premier Jr. Hammermill Crusher with 40 H.P. Motor 440-60-3. Overhauled in our plant $2000.00 f.o.b. Our Plant.

WYODAK CHEMICAL COMPANY
4600 East 71 Cleveland 5, Ohio

CEMENT MILL EQUIPMENT

TUBE MILLS

2—7'x24' Allis-Chalmers Tube Mills, compeb design, completely new with the exception of the shell and heads.

Shell is ⅞" plate, trunnion, head and main bearings of cast steel, liner plates are 3" thick and are made of a special abrasive resistant electric furnace steel. Main drive gear has cast teeth, semi-steel. Main pinion is hard tool steel.

Feeder mechanism is made of cast iron with steel parts. Feed screw running through the trunnion and carrying the material into the mill is made of the same quality electric furnace steel as the liner plates.

These mills will produce 9 tons clinker per hour of average hardness, all under 1¼", at a fineness of 85%, passing a 200 mesh screen. Grinding rocks of an average hardness, production will be about 15 tons per hour. Ball charge required is 35 tons.

1—No. 12 Allis-Chalmers Tube Mill, 6'x22', with Link Belt silent chain drive, complete. Reconditioned, ready for operation.

Shell is made of mild rolled steel plate. Heads are cast in one piece, semi-steel. Main gear is made of cast steel.

All of the liner plates, screen plates, etc., are made of a special abrasive resistant steel.

Production is 5-tons per hour with clinker of average hardness, all under 1¼" size at a fineness of 85% passing 200 mesh screen. Capacity in rock will be 8 tons per hour. This mill will require a ball charge of about 25 tons.

70 tons—¾" to 1¼" used chilled iron grinding balls.

KILNS AND DRYERS

2—8'6" x 7'6" x 125' long Vulcan Kilns

1—7'6" x 7' x 125' long Vulcan Kiln

2—5'6" x 5' x 60' Mosser Kilns

1—5' x 30' Ruggles-Coles A-8 Double Shell Rotary Dryer

WELDERS

300 and 400 amp. Motor Driven Welders, General Electric, Hobart, Lincoln

300 amp. Gasoline Driven Arc Welders, Hobart, Duarc, P&H, Star

FOUR AIR COMPRESSORS

Available for Immediate Shipment

1—1856 CFM, 100-lb. pressure, 23 x 13 x 14 Chicago Pneumatic, Class OCE, 2-stage Air Compressor, direct driven by 300 HP, 3 phase, 60 cycle, 2300 volt, 277 RPM Synchronous Motor, complete with 5-stage automatic starter and MG Set Exciter, after cooler, air filter, 54" x 14' air receiver.

New in 1944—used 10 months.

3—1240 CFM, 100-lb. pressure, Ingersoll Rand XRE-2, 19½ x 12 x 12 Air Compressors, each driven by 200 HP, 3 phase, 60 cycle, 2200 volt, 300 RPM Synchronous Motor, complete with panelboard and after cooler.

New in 1943—used 18 months.

PULVERIZERS

4—Raymond Pulverizers, 5-0, 4-0, 3-0

2—Schutz-O'Neill Pulverizers, 20" and 18"

1—Kent 26" Pulverizer

MISCELLANEOUS

5—Dings Magnetic Separators, IR14, 110 V, 86 RPM, with MG set

½, ¾, 1, 1½ and 2 ton Chain Hoists, standard lift

½, 1, 1½, and 2 ton Electric Hoists, 3 ph. 60 cyc. 220/440 V.

200 HP Motor Driven Mine Hoist, single drum

20 ton G.E. Locomotive, std. gauge Electric

HEAT AND POWER CO.

70 PINE ST., NEW YORK 5
WHITEHALL 3-2172

FOR SALE

CINDER CRUSHERS
VIBRATING SCREENS
SCALES & CONVEYORS
IMMEDIATE SHIPMENT

Cinder Crusher	
10 to 20 ton capacity per hour..	$345
Large Cinder Crusher	
25 to 60 ton capacity per hour..	795
3' x 6'—1 deck Vibrat. Screen..	495
3' x 8'—1 deck Vibrat. Screen..	585
3' x 8'—2 deck Vibrat. Screen..	685
3' x 8'—3 deck Vibrat. Screen..	885
Bag and Block Conveyors.....	495
Portable Bag and Block Piler..	530
15 Ton Truck Scales.....	450
20 Ton Truck Scales.....	510
Belt Conveyors	395

BONDED SCALE COMPANY
128 Bellview, Columbus 7, Ohio
Phone GA 5712 UN 2832 Evenings

Visit our factory. We manufacture more than 150 models of Scales, Screens, Crushers, and Conveyors. Inspect several models in operation.

CRUSHING PLANT

Dixie, Model 3640 Non-Clog with traveling breaker plate. Has extra heavy duty hammers and pins. Can furnish Caterpillar D13000 or two Caterpillar D8800 Diesel Engines for power. Attractive price. For details phone, write or wire:

GIBBS-COOK TRACTOR & EQPT. CO.
DES MOINES, IOWA

40 TON LOCOMOTIVE

AMERICAN 14x22, 4 WHEEL
STD. GA. SADDLE TANK LOCOMOTIVE
ASME BOILER—READY TO WORK

DARIEN CORP.
Murray Hill 2-0042
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New unused Scoopmobile with ¾ cu. yd. shovel, also extra crane attachment and additional 10 ft. tower attachment for high lift. $3200 cash. Loaded Cars. Jacksonville, Florida.

Write Box D-93, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE—*A Good Time to Buy*
Crusher—Symons 3' cone—also 5424 rolls
Dragline shovel comb., Marion 5600, electric
Derricks, steel stiff leg, 5-ton, 50' lt., new
Crusher, Dixie 3640, non-clog, with elec. motor
Loco. Crane, 40-ton, RR Diesel; new 1942.
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Pressure cylinders 2-76' 6" x 7' 6" x 175 lbs.

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8 South Dearborn St., Chicago

FOR SALE

FOR IMMEDIATE DELIVERY OF RUBBER PRODUCTS

Conveyor Belting...Transmission Belting...Elevator Belting...Fire, Water, Air, Steam, Suction or Welding Hose, etc.

CALL, WIRE or WRITE
CARLYLE
THE RUBBER HEADQUARTERS

CARLYLE RUBBER PRODUCTS ARE NEW, GUARANTEED & LOW PRICED

CONVEYOR BELTING

ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"
42"	5	1/8"	1/16"
36"	6	1/8"	1/16"
30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

Inquire For Prices - Mention Size and Lengths

ENDLESS "V" BELTS

"A" WIDTH All Sizes | "D" WIDTH All Sizes
"B" WIDTH All Sizes | "E" WIDTH All Sizes
"C" WIDTH All Sizes | Sold in Matched Sets

Inquire For Prices - Mention Size and Lengths

PROTECT THAT PLANT
FIRE HOSE

APPROVED SPECIFICATION HOSE
EACH LENGTH WITH COUPLINGS ATTACHED

Size	Length	Per Length
2½"	50 feet	$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

SPECIAL OFFER . . . HEAVY DUTY
RUBBER HOSE

WATER HOSE
Each Length with Couplings Attached

I.D. Size	Length	per Length
¾"	25 feet	$4.25
1"	50 "	8.00
	25 "	6.25
1¼"	50 "	12.00
	25 "	7.50
	35 "	10.50
	40 "	12.00
1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

AIR HOSE

I.D. Size	Length	per Length	Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
	50 "	20.00	3.50 "

LARGER SIZES ALSO AVAILABLE
All Prices—Net—F.O.B. New York

CARLYLE RUBBER CO., INC.
62-66 PARK PLACE NEW YORK, N. Y.

ROCK PRODUCTS Classified
Sells in a Hurry . . . . . TRY IT!

FOR SALE
Belt Conveyors, 50 to 60 feet long.
Two cement bags cleaners.
Approx. 75 block racks on rails, ball bearing wheels. Rail Transfer.
Approximately 75 small racks, capacity 30 block per rack.
One No. 2424 Dixie Premier Jr. Non-Clog Hammermill-Hammer crusher.
CONCRETE & CINDER BLOCKS PRODUCTS CO.
10 Buell Road Rochester 11, N. Y.
Phone, Genesee 2121

FOR SALE
AVAILABLE FOR IMMEDIATE SHIPMENT—IN OPERATING CONDITION
One Bucyrus-Erie 30B ¾ yard Steam Shovel and
One Marion Type 32—1 yard Steam Shovel
For full information communicate with
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845 Hanna Bldg., Cleveland, Ohio

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BUCKETS
"Immediate Shipment"

1—Link-Belt Speeder ⅝ yd. NEW Drag Bucket
1—Link-Belt Speeder ½ yd. NEW Drag Bucket
1—Page "RC" ⅝ yd. NEW Drag Bucket
1—Page "RC" ½ yd. NEW Drag Bucket
1—Page "RC8" ½ yd. NEW Drag Bucket
1—Omaha ½ yd. USED Drag Bucket
1—Hendrix "TS" ½ yd. NEW Drag Bucket
1—Hendrix "TS" ⅝ yd. NEW Drag Bucket
1—Link-Belt Speeder ¾ yd. NEW Drag Bucket
1—Hendrix "LS" 1 yd. NEW Drag Bucket
1—Hendrix "TS" 1 yd. NEW Drag Bucket
1—Daniels-Murtaugh "HS" 1¼ yd. NEW Drag Bucket
1—Williams "10M" ¾ yd. NEW Clam Bucket
1—Williams "27B" 1 yd. NEW Clam Rehandler Bucket

"Get your Bucket now from Bucket Headquarters"

EIGHMY EQUIPMENT COMPANY
526 W. State St., Rockford, Ill.

STONE CRUSHERS
15x24, 18x32, 24x36

CONVEYORS
Belt & Drag, tailored to suit your requirements.

PUMP
4", centrifugal, gas driven. Rebuilt —very low price.

THE INDUSTRIAL EQUIPMENT CORP.
Established 1902
705 First National Bank Bldg.
Pittsburgh 22, Pa.
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DEMPSTER DUMPSTERS
Model 150-B — $325.00

BROOKS LOAD LUGGERS
Model 150-A — $325.00
Model CH-150 — $350.00
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TILT-TYPE BUCKETS—$50.00
Immediate delivery

These hoists and buckets were used less than 1 year.

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3000 Multiplex two core—40% air space regular pallets—1000 corners, all for 7¾x15¾ mold box. Reasonable.

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CAST ALUMINUM PALLETS
Special Alloy, Lighter, Better, Guaranteed, Standard or Special Designs, Prompt shipment, Reasonable prices.

Write ALUMINUM PRODUCTS, INC.
P. O. Box 1462 Fort Lauderdale, Fla.

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TRANSIT MIXER

Jaeger 3.c.y., high discharge Model 3HC. Mounted on 1942 MAC Cab-over Model EHU. Truck and mixer completely rebuilt and reconditioned and in excellent condition.

LYNCH BROTHERS
Clovis, New Mexico

Lift Truck, Clark Platform, Gasoline, with $200 extra parts, can be seen in operation.

Also one Towmotor, with Forks.

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8—5' 6" x 40' DRYERS
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One Erie GA-2 gas-air combination shovel and crane No. 4064 with shovel front and 40 ft. boom. And one Williams 1¼ yd. rehandling clamshell bucket.

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FREE SERVICE *for BUYERS*

Here is the quick way to get information and prices on machinery and equipment. Just check the item (or items) listed below about which you desire information. Then send this page to us, and we will take care of the rest.

TEAR OFF HERE

- ....Admixtures, Aggregate
- ....Aftercoolers, Air
- ....Aggregates (special)
- ....Air Compressors
- ....Air Separators
- ....Asphalt Mixing Plants
- ....Bagging Machines
- ....Bags
- ....Barges
- ....Batchers
- ....Belting, Conveyor, Elevator, Power Transmission
- ....Belting, V-Type
- ....Belt Repair Equipment
- ....Bin Level Indicators
- ....Bins and Batching Equipment
- ....Blasting Supplies
- ....Block Machines, Concrete Building
- ....Bodies, Trailer
- ....Brick Machines and Molds
- ....Buckets
- ....Bulldozers
- ....Cars, Industrial
- ....Classifiers
- ....Clutches
- ....Coal Pulverizing Equipment
- ....Concentrating Tables
- ....Concrete Mixers
- ....Concrete Mixing Plants
- ....Concrete Specialty Molds
- ....Concrete Waterproofing and Dampproofing
- ....Conveyors
- ....Coolers
- ....Cranes
- ....Crushers
- ....Derricks
- ....Dewatering Equipment, Sand
- ....Diesel Engines
- ....Dragline Cableway Excavators
- ....Draglines
- ....Dredge Pumps
- ....Drilling Accessories
- ....Drills
- ....Dryers
- ....Dust Collecting Equipment & Supplies
- ....Electric Motors
- ....Engineering Service, Consulting and Designing
- ....Explosives & Dynamite
- ....Fans and Blowers
- ....Flotation Equipment
- ....Gasoline Engines
- ....Gear Reducers
- ....Generator Sets
- ....Grinding Media,
- ....Gypsum Plant Machinery
- ....Hard Surfacing Materials
- ....Hoists
- ....Hoppers
- ....Kilns: Rotary, Shaft, Vertical
- ....Locomotives
- ....Lubricants
- ....Mills
- ....Pulverisers
- ....Pumps
- ....Scales
- ....Screen Cloth
- ....Screens
- ....Scrubbers: Crushed Stone, Gravel
- ....Shovels, Power
- ....Speed Reducers
- ....Tanks, Storage
- ....Tractors
- ....Trucks, Industrial
- ....Trucks, Mixer Body
- ....Trucks, Motor
- ....Vibrators
- ....Welding & Cutting Equipment
- ....Winches
- ....Wire Rope

If equipment you are in market for is not listed above, write it in the space below.

_____

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Send to:

Research Service Department
ROCK PRODUCTS
309 W. Jackson Blvd. • Chicago 6, Illinois

Your Name..... Title.....

Firm Name.....

Street .....

City..... State.....

50" x 24" Champion Jaw Crusher, No. 20-D
36" x 24" Farrel Jaw Crusher, Type 12-B
36" x 15" Farrel Jaw Crusher, Type 22-B
24" x 13" Farrel Jaw Crusher, Type 8½-B
28" x 14" Climax Jaw Crusher, Serial 21028
26" x 13" Champion Jaw Crusher, No. 6
48" x 36" Gruendler Single Roll Crusher
30" x 14" Allis-Chalmers Dbl. Roll Crusher
26" x 15" Farrel Double Roll Crusher
No. 5 Allis-Chalmers Gyratory Crusher
10-ton Austin Western Road Roller
2-yard Manganese Shovel Bucket
1½-yd. Blaw-Knox Material Handling Bkt.
⅝-yard Sauerman Dragline Hoist
1—5-ton Ingersoll-Rand Little David Air Hoist
6—6-ton Peerless Chain Hoists
1—5-ton Triplex Yale & Towne Chain Hoist
1—4-ton Cyclone Chain Hoist
1—3-ton Triplex Yale & Towne Chain Hoist
1—2-ton Triplex Yale & Towne Chain Hoist
36" x 16' Acme Trunnion Type Revolving Screen
4' x 8' Dbl. Deck Summit Vibrator Screen
2' x 8' Triple Deck Tyler Niagara Vibrator Screen
3' x 6' Double Deck Stephens-Adamson Vibrator Screen
150' Heavy-duty Manganese Chain, 6" pitch, with K-2 attachments every third link
560' No. 102 Chain with K-2 attachments
175 Sprockets for 6", 5" and 4" pitch Chain
180' No. 825 Chain with K-2 attachments
125—8 x 5 x 5 Manganese Type A Buckets
46—18 x 9 x 8 Manganese Type A Buckets
83—20 x 9 x 8 Manganese Type A Buckets
About 3,000 Steel Buckets in following sizes: 8, 10, 12, 16, 18, 24 and 26 inch.
Any size Belt or Chain Elevator, with Gear or Speed Reducer
20—Brand new American Pulley Speed Reducers, 13 to 1 reduction
40' x 18" Portable Conveyor
40 HP 860 RPM W. H. Motor 440 V, 60 Cy, 3 Ph.
25 HP 870 RPM Westinghouse Motor, 220 V, 60 Cy, 3 Ph, Slip-ring

All the above equipment is located in our yard and can be inspected at any time upon advance notice.

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3435 N. Fifth St.
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Office Phone Regent 9-7272 — **Night Phone** Hancock 4-7959

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For Your Selection
Modern—Immediate Delivery—Complete Plants
1—3—4—6 Engine Generator Plants
Engine Generator Sets 1800 H.P.
1500 KVA Capacity and Smaller Sets

Fairbanks-Morse	Chicago Pneumatic	General Motors
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International Harvester, Caterpillar, Cummins, Buda, Superior, Waukesha, Sheppard, Lister, Murphy, Hercules

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Specify Your Diesel Power Requirements

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Power Equipment
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NEW YORK 7, N. Y.
Business Established 1898

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1—No. 7 Wonder mixer on rubber tired truck, gas powered with skip and water tank.
1—2-inch Homelite pump.
50—Steel forms for making the staple concrete post.
10—Chase block cars.
450 ft. 24" gauge track for block cars.
1—Transfer car.
400—2-hole 8" x 16" cast block pallets.
5—Triple seal vault forms, make 5 sizes.

THE GALIEN CONCRETE TILE CO.
Galien, Michigan

FOR SALE
Cast Iron Palletts for Concrete Blocks

Standard pattern 8 x 8 x 16 for Stearn block machine, high quality, immediate delivery. Regular 64c Corner or Sash 70c F.O.B. our plant. Cash with order or shipped C.O.D. Write today.

THE WYATT MFG. CO.
SALINA, KANSAS

Complete Crushing Plant 50 tons per hour good operating condition.
One Northwest Shovel, good condition.
1 Yd. Model 104 with 1 shovel and 1 Dragline attachment.
Two Hug Trucks, Model 87Q Diesel 6 Yd. Rock Body Air Brakes.

WEST LAKE QUARRY
Box 392, Route 3
FLORISSANT, MO.

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One oscillating type cement block machine, with new mixer, in good condition, including one new motor. F.O.B. cars Big Rapids, Michigan, $1600.00. Rated capacity 1,000 blocks per day.

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113½ So. Michigan Ave. — **Big Rapids, Michigan**

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1—Plymouth Locomotive, 4 ton, gear driven, model F.L., type 2. Excellent condition.

PRICE $1000.00
F.O.B. cars .....Lee, Mass.

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LEE, MASS.

3—1940-41 Ford - Grico tractors with fifth wheels for semi-trailer mounting. Two 95 H.P. motors. Ready for use with Easton TR-10 trailers.

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Concrete Pipe Molds, Complete
Sizes 6" to 54"
Excellent Condition—Immediate Delivery

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Hattiesburg, Mississippi

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½ yard concrete mixers, paddle type two sack capacity. Reduction geared, low side ejection. Requires 10 horse motor. Price without motor $550.00.

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12—42,000 gal. cap. VERTICAL
2—25,000 gal. cap. VERTICAL
20—10,000 gal. cap. VERTICAL
60— 4,200 gal. cap. VERTICAL
6— 8,000 gal. cap. R.R. CAR TANKS

L. M. STANHOPE
ROSEMONT, PENNSYLVANIA

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We Rent Construction Equipment of All Kinds

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COMPLETE PLANT INCLUDING 108 ACRES LAND, BUILDINGS, MACHINERY AND EQUIPMENT, PATENTS, COPYRIGHTS, TRADE NAMES AND MINING CLAIMS.

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2—Allis-Chalmers Kilns, 7'6" x 64', 7'6" x 71', ⅝" shell, complete with Ray Oil Burners, drives and motors

1—40" x 20' Aluminum Oxide Kiln

1—Allis-Chalmers Size 5 Superior McCully Crusher

1—Set of Allis-Chalmers 16" x 36" Crushing Rolls

1—Spray Dryer, acid proof

1—G. E. Trent Co. Lead Lined Ore Digester

3—Swenson 7' Evaporators, cast iron bodies, vertical steel tubes

2—Tolhurst 48" Hydro Extractors, perforated copper baskets

1—Lead Hydrogen Generator

2—150 HP Erie City H. T. Boilers

1—Harris 125 HP Corliss Engine, with 125 KVA Generator, exciter & panel board

2—100 KW Power Transformers

7—G. E. 5 KVA Light Transformers

3—Steel Bins, 100, 50 and 30 ton

Crushing, Sizing and Shaker Screens

25—Steel and Wood Stave Tanks, 1,000 to 15,000 gal.

10—Bucket Elevators, steel housings, 15' to 50' centers

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25—AC Motors, 1 to 50 HP, 220-440 volt

1—Platinum Rhodium Type A-413-C Thermocouple

Pyromers, Recording Instruments, Small Tools including No. 39 Ingersoll Rand Jackhammer, Machine Tools, steel and lead pipe, lumber, etc.

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One (1) Flory Single Drum Hoist without motor. Drum 48" dia, Face 42", Shaft 4⅞". Condition good.
One (1) 20 H.P. Vertical Capstan Car Puller without motor. Size 12" dia, Face 13", Condition good.
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1—Davey "315D" NEW Diesel Portable
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6—Cleveland NEW Paving Breakers
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Full Stock Moil Points, Chisels, Spades, Drill Steel and Timken Bits—In Stock at Rockford.

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RAILROAD EQUIPMENT

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Commercial Trust Bldg.
Philadelphia 2

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GYRATORY: 42" Gates K. 20" Superior McCully (like new). 20" Superior McCully Gates Nos. 12, 10, 9, 8, 7½, 6, 5, 4, 3, 2, 1 (75 avail.). Telsmith Nos. 4, 5, 6, BC, 9 & 16. Also many Austins, Kennedys and Traylors, many sizes.
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Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryer, Derricks, Elevators, Excavators, Generators, Hoists, Kilns, Draglines, Drag Scrapers, Dredges, Drills, Engines, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Slacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

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7229 Rogers Avenue — CHICAGO (45)

CRUSHERS

24x36 New England Jaw
Size 32 Telsmith Reduction

VIBRATING SCREENS

3x8 Kennedy 3 Deck
4x10 Robbins 2 Deck

DARIEN CORPORATION
Murray Hill 2-0042
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from 5 Warehouses

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Double stiffleg derrick mounted on 20' high tower designed to handle 50 tons at 50' radius. Mounted on rectangular tower 44' wide x 40' deep. One 46' mast on each front corner with 80' boom and 60' stiff-legs. This derrick has dual equipment throughout and can be separated into two complete units.

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New and relaying. Also frogs, switches, tie plates, angle bars, track accessories.

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480 Lexington Avenue, N. Y.
Also Pittsburgh, and Reno, Nevada

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1—8' Gyratory Telsmith crusher, mounted on chassis, electric power, 40' discharge belt conveyor.
AIR COMPRESSOR, Gardner-Denver, 220' with Waukesha 6 cyl. motor, on skids.....$1,400.00
WAGON DRILL—with air hammer, drills, extra drill points. 200' pipe, valves, air hose and fittings. (Sullivan) $700.00

JOLIET CASH & CARRY LUMBER CO.
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1 Besser Victory Tamper Block Machine. Fully Automatic. Capacity 4½ blocks per minute. Completely overhauled with racks, pallets, and mold boxes for 4", 6", 8", 12" blocks and fractional units. Also ashlar pattern. Immediate Delivery.

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MIDWEST STEEL CORP.
GEN. OFF.: CHARLESTON 21, W. VA.
WAREHOUSES:
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1—420 cu. ft. SCHRAMM Diesel portable compressor.
2—20-ton std. ga. Gas Locos.
1—35-ton DAVENPORT std. ga. Gas Loco.
1—45-ton PLYMOUTH Type 0-4-0 std. ga. Diesel locomotive.
1—45-ton PORTER Type 0-4-4-0 std. ga. Diesel Elec. Loco.
1—78-ton BALDWIN Type 0-6-0 Standard Ga. Side Tank Locomotive—new 1923—rebuilt.
1—20-yd. WESTERN Air Dump Car, Vertical Cylinders.
4—50-ton cap. Std. Ga. Flat cars, 34' 10" long.
6—1240, 2200 and 3000 cubic foot stationary air compressors, all direct connected to synchronous motors—new 1942 and 1943.

B. M. WEISS COMPANY
Girard Trust Company Building
PHILADELPHIA 2, PA.

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1—80-ton Baldwin 0-6-0 separate tender switcher, built 1925. A.S.M.E. boiler, piston valves. Walschaerts valve gear, overhauled and up to date on all I.C.C. requirements.

1—20 ton Whitcomb Diesel-Mechanical 36" gauge locomotive, four wheel type.

2—20 ton gasoline locomotives, 4 wheel type, built 1941 and 1942, overhauled, standard gauge.

1—25 ton American Diesel Locomotive Crane, built 1942.

1—Williams Clamshell digging bucket, 1 yd. capacity, heavy duty type with teeth, practically new condition.

Birmingham Rail & Locomotive Co.
BIRMINGHAM 1, ALABAMA

FOR SALE

1—No. 7 Joltcrete block machine with power driven carriage offbearer. Includes attachments for making 3", 4", 6", 8", 10", 12" and Rock Face blocks. Enough pallets for a day's production, all sizes.
1—28 cu. ft. Stearns Mixer with direct drive motor, on wheels.
1—Cement sack cleaner
1—Boom and air hoist with offbearer basket.
78—Steel racks, 48—8x8x16 block capacity.
1—Barrett-Cravens lift truck.
12—Carts for storing cement, with jack lift.
The above will only be sold in its entirety and no item separately. Can be seen in a Middle Western plant.
Write Box D-86, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE

1—3 FT. x 50 FT.
ALLIS-CHALMERS DRYER.

SILICA PRODUCTS COMPANY, INC.
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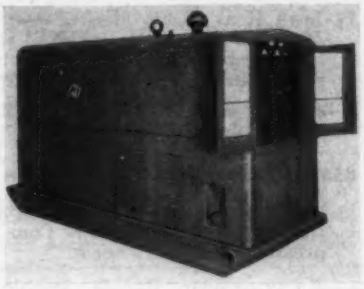
PORTABLE DIESEL GENERATOR SETS



15 KW 30 KW 50 KW
INTERNATIONAL UD-14—UD-18
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RADIATOR COOLED-SKID MOUNTED
60 cycle 127/220 volts
50 cycle 230/400 volts
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FOR SALE

Besser Victory Tamper block machine, overhauled and in good condition. Capacity 3000 block per eight hour shift of 8" - 10" or 12" sizes or 6000 smaller sizes. Immediate delivery, complete with 30 cu. ft. Besser Mixer; Erickson Platform lift truck, some 56 steel racks; 4500 steel pallets 10" and 12", suitable for all block sizes made on this machine; attachments for 4" hollow; 4" solid; 5" solid; 6" hollow; 8" hollow; 10" hollow and 12" hollow block, and half block, jam block and corner block in each size. Also motor, shafting and pulleys. In addition there are a number of spare parts, liners, bushings, cores, etc. Will be sold only as a unit, and subject to prior sale. Price complete $8,000 cash, loaded cars, R. I. Lampus plant, Springdale, Pa.

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B-Erie 1¼-yd. gas-air GA-3 shovel, rebuilt.
Marion electric shovels, 4, 5, and ⅝-yd.
Bucyrus 50B and 80B steam shovels.
Allis-Chalmers 27" Gates 12K gyratory crusher.
A-C Superior 50" x 24" crushing rolls.
Euclid 6-yd. bottom dump crawler wagons (8).
Porter, Vulcan 18-ton stm. locos., 36", rebuilt.
Whitcomb 8-ton gas locomotives, 24" ga., (4).
Steam locos. 29 to 50 tons, std. & 42" ga.
25-yd. Diesel bottom dump truck-trailers (7).

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A 12 foot marble rubbing bed.
Price, $400.00 F.O.B. car.

DELANO GRANITE WORKS
DELANO, MINNESOTA

AIR COMPRESSORS
BELTED: 355, 528, 676, 1000, 1300 & 1570 Ft.
ELECTRIC: 473, 676, 807, 1302, 1722 & 2200 Ft.
DIESEL: 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 230, 310, 540 & 1300 Ft.
STEAM: 49, 310, 528, 1300, 2200 & 3600 Ft.

CLAMSHELL BUCKETS, SKIPS & GRAPPLES
Owen R A & H Stone Grapples.
2 Yd. OWEN Type S Material Handling.
1½ Yd., 1 Yd. & ¾ Yd. HAYWARD Class E.
18 Steel Skips 6½ x 6 x 2½.
5 Ton Bucyrus Rock Grabs.

CRANES AND DRAGLINES
1—16 Yd. 160' Boom Electric Caterpillar Dragline
⅝ Yd. 5 Ton O & S 30 Ft. Boom.
12 Ton NORTHWEST 50 Ft. Boom Gas.
20 Ton LIMA, 750 Diesel, 65 Ft. Boom.
25 Ton BROWNING & 30 Ton AMERICAN Loco.
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom.

CATERPILLAR SHOVELS
2 Yd. Marion Steam Shovel.
¾ Yd., 1½ Yd., 2 Yd. & 4 Yd. MARION Electric
1 Yd. NORTHWEST Gas.
1½ Yd. LIMA Diesel.
1⅝ Yd. BUCYRUS 41B Steamer.
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46—KOPPEL, 1¼ Yd 24 & 30 In. Ga., V Shaped.
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20—Std. Ga. 12 Yd., 16 Yd., 20 Yd. & 30 Yd. Cap.
15—Std. Ga. 50 Ton Battleship Gondolas

BOX, FLAT & TANK CARS
9—50 ton std. ga. heavy duty flat cars.
30—8000 gal. cap. tank cars.
30—40 ton std. ga. box cars.

HOISTING ENGINES
Gas: 15, 30, 60, 100 & 120 HP.
Electric: 30, 52, 80, 100 & 150 HP.
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75, 90, 180, 200 HP. F. M. Engines.
175 KVA Worthington 3/60/2300.
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343 KW. Fairbanks-Morse 3/60/480 V.

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5'x22" HARDINGE CON. Dry Ball Mill.
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4x8, 8x6 & 16x9 Straight Ball Mills.
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2x4½, 6x12 & 5x12 ROD MILLS.

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JEFFREY 24x20 & No. 1 Sturtevant Ring Roll.
RAYMOND Auto Pulverizer No. 0000, 0 & 3.

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10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

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8, 10 and 14 ft. Separators, Gayco & Bradley.

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36x60 Fairmount & 36x20 Diamond.

JAW CRUSHERS
10x8, 13x7½, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 26x12, 30x15, 30x13, 36x15, 36x30, 36x18, 36x14, 36x9, 36x6, 36x10, 36x24, 42x9, 48x24, 48x36, 60x42, 84x66, 36x16, 9x36.

CONE & GYRATORY CRUSHERS
5 No. 19, 25, 37 & 49 Kennedy.
18 in., 24 in, 30 in., 36 in. & 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory, also 16 inch 8 in. Traylor T. Gyratory.
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8, 9½ & 21.
7—Symons Cone, 2, 3, 5½ and 7 ft.
6, 10 & 13 Inch Superior McCullys.

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BELT: 1000 Ft. 60 In., 700 Ft. 40 In., 600 Ft. 36 In. 800 Ft. 30 In., 1642 Ft. 24 In., 517 Ft. 20 In., 297 Ft. 18 In., 500 Ft. 16 In., 300 Ft. 14 In.
IDLERS: 54 In., 42 In., 36 In., 30 In., 24 In., 20 In., 18 In., 16 In. & 14 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 Ft. 24 In., 20 In. and 36 In. Sections.

ROTARY DRYERS AND KILNS
36 In.x20 Ft., 3 Ft.x30 Ft., 4 Ft.x30 Ft., 54 In. x30 Ft. 42 In.x24 Ft., 5 Ft.x30 Ft., 5 Ft.x16 Ft., 5 Ft.x60 Ft., 6 Ft.x60 Ft., 6 Ft.x20 Ft., 6 Ft.x70 Ft., 10x20, 7½x100 & 8x110 Ft. Kilns.

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GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 25 Ton 100 Ft. Boom. 75 Ton 135 Ft. Boom.

LOCOMOTIVES
GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14, and 30 Ton.
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 40 Ton.
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HUMMER ROTEX, NIAGARA & ROBINS.
REVOLVING: 3x12, 3x16, 3½x18, 3x24, 4x16, 4x20, 4x23, 4x24, 5x30, 5x20, 6x20.

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1945 Model 2036 Universal Roller Bearing Primary Crushing Unit complete with Hopper, Feeder and Under Crusher Conveyor. Available in 60 days. Excellent condition.

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Koehring Model 601 Diesel shovel, 2 yards.
Lorain 75B 1¼ yd. shovel and crane.
Link-Belt Diesel crane 1¼ yd. with 60′ boom.
Link-Belt K48 2½ yd. dragline, new 1935.
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Marion 37 shovel, steam, 1¾ yds.
Marion Model 450 steam shovel, 1¼ yds.
Marion Model 450 gas-elec. shovel, 1¼ yds.
Marion Model 331 gas shovel.
Northwest Model 104, 1¼ yd. crane, boom 70′.
P & H 400 shovel-crane ⅝ yds. capacity.
P & H 600 crane, 1 yd. capacity.
Universal 35, shovel-crane-backhoe, ½ yd.
Lorain 40 truck crane, 8 tons capacity.
Speeder shovel-crane, ½ yd. capacity.
Northwest 105 shovel-crane-backhoe, 1 yd. cap.
Bucyrus-Erie 50B steam shovel, 2 yds.
Monighan 3¼ W. Diesel dragline, 92 ft. boom.
Osgood 1 yd. shovel-crane.
Bucyrus-Erie elec. tunnel shovel, 1 yd.
Osgood 1½ yd. shovel.
Osgood shovel, 1¼ yds. gas.
Byers Bear Cat ⅜ yd. crane.
Byers Bear Cat ½ yd. backhoe and crane.
Gantry crane, 5 ton, 40 ft. span, 15 ft. overhang.
McMyler 20 ton loco. steam crane.

TRACTORS AND MISCELLANEOUS

International TD14 tractor with bulldozer.
International TD35 tractor with bulldozer.
Caterpillar D6 tractor with 6 yard scraper.
D4 trackrunner.
Allis-Chalmers HD-10 tractor and angledozer.
Allis-Chalmers HD-7 tractor with Trailbuilder.
Allis-Chalmers WS tractor with bulldozer.
Cletrac 40D tractor with angledozer.
Allis-Chalmers K tractor with bulldozer.
Allis-Chalmers Model L tractor with bulldozer.
Allis-Chalmers LO tractor with 7 yd. scraper.
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International TD 40 tractor with bulldozer.
Buffalo-Springfield 16 ton 3 wheel road roller new 1941.
2 Dempster Dumpsters with 20 buckets.
Bucket elevator, vertical, 35′ 22″ buckets.
Gallon 10-ton, 3 wheel roller.
Drill steel, 1¼″, bitted and shanked.
500 drill bits, 1-B and Timken. Various sizes.
Several dredge pumps available from 6″ up.
3 Euclid Model 1-2WCL dump trucks.

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Smith 1½ yd. tilting mixer 30 hp. electric drive.
3 B-K 5 yd. transit mixers on Macks.
Jaeger, 4 yd. truck mixer on Mack truck.
2 Jaeger 3-yd. truck mixers, unmounted.
2 Jaeger 5 yd. truck mixers, unmounted.
2 Jaeger 7 yd. truck mixers, unmounted.
3 Rex 5 yds. truck mixers, unmounted.
Rex, 4 yd. truck mixer on Autocar.
Mixer 28S, Smith electric stationary.
Mixer, 56S, Smith tilting skid mounted.
Mixers, two Ransome 42S, elec. Right and left.
Mixer, Koehring 28S, gas, skid mounted.
Mixer, Jaeger 14S, on pneumatic tires.
Fuller Kinyon bulks cement unloader portable.
Koehring 34E dual drum paver.

ASPHALT PLANTS

Standard Plant 3000 lb. cap. Complete, self-contained, including Diesel generating set.
Cedar Rapids Portable 60-80 tons per hour cap.

CRUSHERS—CRUSHER PLANTS

Roll, 54x24, 54x20, 48x36, 30x24.
Allis-Chalmers 42″ gyratory.
Gyratory crusher: K.V.S. 30, 37-S, 49; 32, 8A, 8B; Traylor 8″; McCully, 12″, 8″, 6″.
Allis-Chalmers 6″ fine reduction crusher.
Jaw: 6x12, 9x16, 16x20, 14x24, 12x26, 13x30, 16x32, 24x50.
Complete Rock Crushing, Sand and Gravel Plants.

BUCKET—STONE SKIPS

Blaw-Knox ⅞ yd. Clam, digging.
Hayward ⅞ yd. Clam, digging.
½ yd. Haiss Clamshell, rehandling.
10 Battleship 2-3 yd. steel stone skips.
Hayward ⅜ yd. Standard Orange Peel.

LOCOMOTIVES—CARS

Mack 60 ton std. ga. gas locomotive.
Whitcomb 20 ton 36″ ga. Diesel loco. Rebuilt.
Baldwin-Westinghouse 25 ton elec. loco., std. ga.
American 45-ton, steam, saddle tank.
Vulcan 30-ton, steam, saddle tank.
Vulcan 25-ton, steam, side saddle loco.
Vulcan 8-ton, std. gauge, gas.
Vulcan 6-ton, gas, 36″ gauge.
Porter 12-ton, saddle tank, steam, 36″ gauge.
3 Western Steel, 20 yd. air dump cars.

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30 Church St. New York, N. Y.
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Ingersoll-Rand No. 40 Drill Sharpener, Type 41 S.P. Serial No. 7841 Rebuilt and Guaranteed Low Cash Price

Vermont Marble Co.
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NEW EQUIPMENT NEVER USED

1—Pioneer Jaw Crusher 30″ x 42″ with flywheel cut for 12C belts on original skids.

1—Iowa Heavy Duty Rock Feeder 42″ x 10′ on original skids. The two above units operate together.

2—150-ton Rock Hopper Bins—2 compartments each.

USED EQUIPMENT A-1 CONDITION NOW IN OPERATION

1—Gardner Denver 315 Gas Compressor on Steel Wheels.

1—4′ x 12′ Cedar Rapids Double Deck Standard Screen with motor mounting and V-belt drives.

1—D-8 Caterpillar with LP Scoop.

1—P & H 1¼-yd. Shovel—Model 650; Serial No. 4419; with extra bucket, numerous extra parts.

ALL ABOVE EQUIPMENT CAN BE SEEN AT MACEDONIA IOWA QUARRY—PHONE 50

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YOUR FIRST SOURCE FOR FIRST RATE REBUILT EQUIPMENT

- Rotary Dryers and Kilns.
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Complete Information on Request
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1—Sand Dredge, with Swintek Ladder, steel hulls, 15″ EMSCO pump with 500 HP motor, 4 x 2″ Priming pump, 3 drum Thomas hoist. Photo on request.
1—150 Ton Fairbanks R. R. Track Scale.
2—50 Ton 0-6-0 Porter Locomotives, built 1942.

McCARTNEY MACHINERY CO.
Box 35 S.S., Youngstown, Ohio

FOR SALE

Brand New Conveyor Belting

1 piece 42″ wide, 568′ long, Goodrich Heavy Duty Conveyor Belting, 5/16″ top cover, 1/8″ bottom cover, 6 ply, 42 oz.

1 piece 42″ wide, 1017′ long, Goodrich Heavy Duty Conveyor Belting, 5/16″ top cover, 1/8″ bottom cover, 6 ply, 35 oz.

1 piece 42″ wide, 1014′ long. Same construction as above.

1 piece 42″ wide, 1023′ long. Same construction as above.

244′—60″ wide (2 endless belts ea. 122′). Same construction as above.

146′—60″ wide (2 pieces each 73′). Same construction as above.

1 piece 60″ wide, 400′ long, ½″ top cover, 1/8″ bottom cover, 7 ply, 35 oz.

1 piece 60″ wide, 400′ long, 5/16″ top cover, 1/8″ bottom cover, 6 ply, 35 oz.

ATLANTIC EQUIPMENT COMPANY
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FOR SALE

One Sauerman 1 yd. slackline 75 H.P. Electric two drum hoist complete with 90 ft. steel mast and all equipment. 60% new price.

Very fine condition.

FRED H. ELDREDGE
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FOR SALE

Stearns Skip Hoist Loader, 42 Cu. Ft.; complete with independent motors.

COMAC BUILDERS' SUPPLY CORP.
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FOR SALE

200 H.P. Fairbanks Morse Diesel Engine complete with generator and alternator, in good operating condition.

QUARTZITE STONE COMPANY
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FOR SALE

Model 12K Gates Crusher and complete electrical drive consisting of 150 HP Westinghouse Motor, grids, manual controller, G.E. Oil switch, disconnect switch, etc. Can be inspected at our plant at Frederick, Maryland.

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!! DRILL EQUIPMENT !!

NEW—Immediate shipment

FIVE CARLOADS TIMKEN and INGERSOLL - RAND Hollow Hex and Round DRILL STEEL and DETACHABLE BITS—ALL SIZES

—At two-thirds of new prices—A saving of 33⅓% to you. This equipment is new and in perfect condition. I will ship subject to your approval before payment.

ALSO: NEW AND USED JACKHAMMERS, PAVING BREAKERS, WAGON DRILLS, PUMPS, BROOKS LOADLUGGERS, DEMPSTER DUMPSTERS, AND PLENTY OF BUCKETS TO MATCH.

I have overbought and I have some real bargains for you.

SAM SMITH, Machinery

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Plant—2nd Street and Penna. R. R.
Fernwood, Penna.

SAND, GRAVEL AND CRUSHING PLANTS DESIGNED AND EQUIPPED. NEW AND USED CONTRACTORS EQUIPMENT FOR SALE AND RENT

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24" GAUGE RAILROAD EQUIPMENT

2000—Track Feet 25-30 lb. Rail Complete with Steel Ties, Splice Bars and 4 Turnouts.

14—1-½ Yd. All Steel Koppel and Easton Side Discharge Dump Cars, Roller Bearing Trucks.

2—8 Ft. Steel Frame Flat Cars, Roller Bearing Trucks.

2—H-7 Milwaukee Gasoline Locomotives.

OTHER NARROW GAUGE EQUIPMENT TOO!

SEND US YOUR INQUIRIES

IRON & STEEL PRODUCTS, INC.

41 Years' Experience
13492 S. Brainard Ave., Chicago 33, Illinois
"ANYTHING containing IRON or STEEL"

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Orton Gantry Crane, 2½ yd., 65 ft. Boom, cut down to Track Operation, Electric Driven.

ABBOTT SALVAGE COMPANY
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MODERN EQUIPMENT

25 ton Browning 8 C Locomotive Crane, new, 1942.
25 ton Ohio Locomotive Crane, built 1942.
25 ton Ohio Gas Locomotive Crane, 55' Bm.
45 ton Porter Diesel-electric Locomotive.
25 ton Whitcomb Gas Locomotive, new 1942.
30 ton American Steel Stiffleg Derrick and Hoist.
9 Western 20 yd. Air Dump Cars, Rebuilt.
9x10 Lambert 8 drum Steel Hoist.
315 ft. Ing. Rand Portable Compressors.
475 HP Fairbanks-Morse 8-cyl. Diesel.
120 HP Atlas 6 cyl. Diesel Generator Set.

Mississippi Valley Equipment Co.
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FOR SALE

1—8 ton per hour Kuntz Hydrator. Each replaced for larger sizes. These are rebuilt and 100% efficient—90% new.
1—3 ton per hour Clyde Batch Hydrator.
We have a number of lime feeders and a number of hydrate feeders.
1—Portable Ingersoll Rand Air Compressor—315 cu. ft. per minute. Waukesha engine. First class condition—ready for use.
One complete Lime Hydrating Plant, including buildings.
One 212 Gallon Road Grader 12' Blade—Excellent condition.
1—8 ton Clyde Continuous Hydrator.
1—Killefer Road Rooter.
1—7½ h.p. Gasoline Driven Power and Lighting Plant.

Lime & Hydrate Plants Co.
50 S. Beaver Street, York, Pennsylvania

FOR SALE

1000 New Besser Pallets 18½ x 26
80 Model 72 or 60 Block Racks Part Galvanized.

All of above are new and ready for immediate shipment

WANTED

Used Dunn Automatic Tile Machine in Good Condition.

VICTORY STEEL FABRICATING CO.
508 N. Tillamook St.
PORTLAND, OREGON

Complete Good Roads Portable Crushing Plant 14x40"
Cedar Rapids 36x14", 16x24" Rogers, Blake type and 30x42" Pioneer top eccentric Jaw Crushers
Austin Model 105 Gyratory Crushers, good
Allis-Chalmers type B reduction Gyratory Crusher
Denver Iron WKD 15x36" dbl. smooth roll crusher
Allis-Chalmers Superior 54x24" double roll crusher
¾-yd. P&H shovels, 206 & 400.
Barber-Greene Bucket Loaders, 42 & 42B
1½-yd. Bucyrus-Erie 30B Diesel Dragline.
1½-yd. Koehring Model 601 & Link-Belt Model K-38 Shovels draglines
1¼-yd. Bucyrus-Erie Model 41-B Steam Shovel
1 yd. Bucyrus-Erie Diesel Shovel
1 Apron Conveyor 39"x15' long
¾-yd. Marion Electric Shovel
1 yd. Bucyrus-Erie 20B Elec. Shovel Crane
Two Jeffrey type B Swing Hammer Mills
150 HP Westinghouse 2200V 1200 RPM Motor
75—800 HP Fairbanks Diesel Engines
Gasoline & Diesel Trucks, various sizes.
30 Ton Electric Battery Locomotive, with charger

MID-CONTINENT EQUIPMENT CO.
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ROTARY SCREEN

Telsmith rotary screen, 5 sections, 5' dia. 25 feet long. Complete with motor, switchbox, 2 extra pinion drive gears, 36 extra pieces of screen.

For complete information and location write to

JESSE S. MORIE & SON
Mauricetown, N. J.

BINS: 1—Blaw-Knox Bin, three compartment, with wood sideboards, 40 tons capacity in each compartment, with three gates, with Johnson batch hopper, with 3 beam scale, water measuring tank and vertical heavy duty bucket elevator on heavy duty, single chain, buckets 20" wide, 18" on chain side, 16" deep. One 12" x 25' flat belt cement conveyor for conveying cement sacks, with 2 H.P. motor, with 20 H.P. heating boiler 15 lbs. pressure. Plant fully enclosed, offered with or without enclosure.

1—NEW 170 cu. yd. cap. water level, all steel, bin, 20' x 20', single compartment, with V bottom, 13'6" clearance from bottom of bin to base of column. NEW.

DRAG SCRAPER: Sauerman 1 yd. capacity with Crescent drag scraper bucket, 60 H.P. gasoline powered, 2 speed, hoist, all cables, blocks, etc.

GYRATORY CRUSHERS: All sizes and types.

JAW CRUSHERS: Traylor 36 x 42, capacity 6" material 144 tons per hour, 4" material 76 tons per hour, manganese fitted, excellent condition. Also other sizes 10 x 20 to 48 x 60.

REDUCTION CRUSHERS: Traylor 4 ft. and 2'4" type TX, with motor, V-belt drive, etc., complete.

ROLL CRUSHERS: Double roll crusher. Allis-Chalmers 24 x 54" dia.; 18 x 42" dia.

HAMMER MILL: Dixie Mogul size 5024, hopper opening 40 x 24, with $1,000.00 worth of extra new wearing parts.

VIBRATOR FEEDER: Jeffrey Traylor 6' x 6', open pan deck, powered by four No. 5 heavy M-4 motors, including motor generator equipment for 440 volt, 3 phase, 60 cycle, operation; capacity 1500 tons of earth and stone per hour, maximum size stone 3' cubes.

1—48" x 10' with two 58M, 4 power units.

ROAD ROLLER: Galion 10 ton, 3 wheel, gas; overhauled.

KILNS, COOLERS, DRYERS: 1—7'6" x 100' and 1—6'6" x 120', with or without all necessary auxiliary equipment. 1—10' x 90' cooler or dryer.

Also several other sizes.

LOCOMOTIVE—STEAM: 1—Lima 80 ton, 6 wheel, switcher with tender, thoroughly modern, excellent condition. Sale or rent.

LOCOMOTIVE—GAS: 25 ton, standard gauge, air brakes, etc.

SCREENS: Telsmith 4 x 10, triple deck. Jeffrey Traylor 4' x 6'6", single deck, capacity 25 tons per hour, ¼" to 1¼" material. Robins 4 x 6 double deck and 3 x 8½ triple deck, both with motors.

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Lansdowne Theatre Building
LANSDOWNE, PA.
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CONVEYOR BELTING IN STOCK FOR IMMEDIATE SHIPMENT

1800' 18" 5-ply Quaker
560' 18" 5-ply Hercules
1340' 18" 4-ply Hercules
860' 24" 5-ply Hercules
500' 24" 4-ply Hercules
530' 30" 4-ply Hercules
516' 30" 5-ply Hercules

⅛" top & 1/32" bottom cover on all above belting.

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Office Phone Regent 9-7272 Night Phone Hancock 4-7959

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CRUSHERS, ROLLS, MILLS
A-C Gyratory 2-D Reduction Crusher, Short Head.
11" Traylor Bulldog Gyratory Crusher.
12"x32"-D Acme Jaw Crusher.
No. 2½ Wheeling Jaw Crusher.
No. 16-40 Gruendler Peerless Grinder.
No. 2 Williams Semi-Vulcanite Hammermill.
2—No. 0 Sturtevant Rotary Fine Crushers.
30"x24"-A Jeffrey Hammermill.
2"x6" Open Door Laboratory Type Jaw Crusher.
2"x6" Sturtevant Roll Jaw Laboratory Crusher.
2"x3" Denver No. 1 Laboratory Jaw Crusher.
4"x6" A-C Roll Jaw Laboratory Crusher.
14"x24" Sturtevant Double-Roll Crusher.

VIBRATING SCREENS
2'x6' 2-deck Robins Gyrex Vibrating Screen.
3'x5' and 4'x5' 2-deck Hummer Magnetic Screens.
3'x5', 4'x5' & 4'x7' 1-deck Hummer Vib. Screens.
Revolving: 66"x10', 5'x18' and 30"x12'.
Conical: 28" to 44" diam. 54" long 1" perf.

CONVEYORS AND ACCESSORIES
16"x42' Steel Scraper Conveyor with Frame.
Conveyor Pulleys, Idlers, Bearings, Gears, Belt.
Scraper Conveyor with 8" Drag Chain.
900' Prewar 8-ply 48" wide Conveyor Belt.
Belt Trippers for 14", 16", 18", 20" & 24"-w.
Dings Magnetic Pulleys, 30" diam. 30" face.
Garvey Magnetic Pulleys, 30" diam. 18" face.
Gravity Roller Conveyors, 6" to 20" wide.
3 Bushman Vibrators for Picking Tables.
Merrick Weightometer for 30" Belt or Less.
16" Jeffrey Steel Apron Conveyor.
48" Smooth Top Plate Conveyor.

BUCKET ELEVATORS
18" Open & Closed Spaced Type Bucket Elevators.
10" Open and Closed Elevators, Belt or Chain.
12"x40' Continuous Type Bucket Elevator.
12"x50' Continuous Type Bucket Elevator.
14"x50' Chain Bucket Continuous Elevator.
11"x30' Continuous Steel Frame Chain Elevator.
Belt Elevators with 10" and 16" C-Type Buckets.
1500' of Engineers Type A-121 Bushed Chain.
6"x38' Continuous Type Bucket Elevator.

MISCELLANEOUS
2-Drum 15-hp. Novo Hoist.
1-Drum 10-hp. Novo Hoist.
1-Drum 25-hp. Mead-Morrison Hoist.
1-Drum 50-hp. Mead-Morrison Hoist.
12 Gear Reducers, Carpullers, Trolleys.
12x12" Simplex Bin Gates & ½-hp. Reeves Drives.
8x6, 6x6, 6x4 & 4x3" Centrifugal Pumps.
24" & 30"-g Side & End Dump Cars and Locos.

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1 R4U Climax 85 HP power plant completely rebuilt with clutch and drive pulley, excellent for field crusher setup..$ 425.00
3400 lineal ft. 8 x 8 Blaw-Knox Road Forms @ 50c per lineal ft..... 1700.00
2 Ord Finishing Machines 10-12' widths, each 125.00
1 Buffalo Springfield 5 ton Roller 3 wheel, with scarifier 950.00
1 Rex Paver 27E 1000.00
1 100 gal. Barnes Road Pump..... 600.00
1 Briggs & Stratton Concrete Surface Finisher 150.00
1 80 gal. Deep Well Pump..... 80.00
1 No. 5 Telsmith Sand Tank..... 60.00
1 No. 7 Telsmith Sand Tank..... 100.00
40" Rotary Screen with lot of new screen sections 125.00
Apprx. 110 ft. Bucket Elevator Chain No. 823 with K-2 attachments every fourth link completely rebushed with special alloy pins and bushings @ 90c per lineal foot 99.00
Apprx. 100 lineal ft. 1¼" pitch Jeffery Steel Roller Chain in good condition @ 50c per lineal foot..... 50.00
9 x 16 Champion Jaw Crusher—New Jaws and Bearings 100.00
1 Double Roll New Holland (4 rolls) Crusher with 2 new Roll shells (will crush 100 cu. yd. cinders daily)..... 175.00

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1¾ Yard Marion Shovel
Model #371 Crawler Type with Dipper Stick. 80' Boom and New Haiss Bucket. Can Be Seen in Operation Here. Price $18,000.00. East Coast Lumber Terminal, Sand & Gravel Division, P.O. Box 200, Farmingdale, N. Y. Telephone Farmingdale 472.

Monighan 3 yd. Electric Dragline. Also Diesel. Diesel Drag. on Trucks, 100' bm, 2 yd. bucket. Diesel Cat. Crane, '42, 65' boom., 3¼ yd. cap. Electric Shovels on Cats, 2, 3, & 4 yd. Northwest Dragline, 45' boom, 1 yd. bucket. RD6 Cat. & 12 yd. Scraper; 2 yd. Tournapulls. Athey Mobiloader for Cat. D6 or RD6 Tractors. New Dryers—6x30, 5½x30, & 5x40; Misc. used. Compressors—Gas, Elec., & Diesel, 250' to 3500'. WANTED—Your offers of Good Used Equipment.
James Wood, 53 W. Jackson Blvd., Chicago 4, Ill.

EQUIPMENT WANTED

WANTED TO PURCHASE
One 42" or 60" Gyratory Crusher, Traylor "Bull Dog" preferred.
Ten 15-ton or eight 20-ton Euclid Diesel End Dump Trucks.
One thousand lineal feet of 54" Conveyor Belting with troughing carriers, idlers, pulleys, drives, speed reducers and electric motor. Also steel framing for above conveyor.
All equipment to be in first class mechanical condition.
DOLESE BROS. CO.
13 N. W. 13th St., Oklahoma City 1, Okla.
P. O. Box 1273 Phone 3-2314

WANTED
8—Concrete Mixer trucks 2 to 3 cu. yd. cap.
1—75 to 100 ton 3 bin portable batcher plant, or 1—100 to 150 ton 3 bin stationary batcher plant. Either of plants with 2 cu. yd. weighing batcher 3 beam scale.
1—Bucket conveyor, load 3 bins approx. 50 tons hr. Elect. drive 60 cyc. 220 V 3 ph. All A-1 condition.
Write Box E-1, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED
One automatic brick machine for concrete brick.
SAVANNAH BUILDING SUPPLY COMPANY
P. O. Box 1461 Savannah, Ga.

WANTED TO BUY
BLOCK MACHINES
Any type or make. Write or phone.
H. R. DOUGLAS
2239 N. 34th St. Milwaukee, Wis.
Kilburn 5335

WANTED TO BUY
2-yd. Sauerman slack line cable way bucket and carriage
Two drum electric hoist for slack line work 100-125 H.P.
Box 645
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FOR SALE
Lime and Crushed Stone Plant with quarry estimated at 5,000,000 tons of high grade limestone rock. Good market for all materials crushed. Located in the Arkansas Ozarks.
LILY WHITE LIME COMPANY
Rogers, Arkansas

— PLANTS FOR SALE (Cont'd.) —

For Sale—

SHASTA DAM SAND AND GRAVEL PLANT AND 10-MILE CONVEYOR EQUIPMENT

Including:
6000—36" AND 42" IDLERS.
Pulleys and Drives.
LATE MODEL 200 HP., 1800 R.P.M. GE MOTORS, complete with Starting Equipment.
Western Gear Reducers, 200 HP., 40 to 1 Ratio.
8 x 12 MARCY ROD MILL.
Dorr Hydroseparator.
30" Tripper and Trestle.
Merrick Weightometer.
All Types of Pumps, complete with Drives.
42" Pendulum Boom Conveyors, 100' and 200'.
Electric Line Equipment, Transformers, Motors and Supplies.
Other Miscellaneous Contractors' Equipment.

Subject to Prior Sale

Write, Wire or Telephone Redding 1440

COLUMBIA CONSTRUCTION CO., INC.
Box 579 Redding, California

FOR SALE

Simplicity Asphalt Plant
Capacity 35 Tons per Hour.

BITUMINOUS MATERIALS CO.
LOUISVILLE 2, KY.

COMPLETE ROCK PLANT

Capacity 50 tons per hr. Consists of 3 gyratory crushers, 65' elevator, heavy duty washing and sizing screen, water pump, four electric motors complete with switch boxes & starters. Also 300 ton 4 compartment bin. Good condition. Easily dismantled. Price right for quick sale.

Write Box D-96, c/o Rock Products,
309 West Jackson Boulevard, Chicago 6, Illinois

— PLANTS WANTED —

WANTED

Concrete Block Plants complete or will pay cash for good used concrete machinery and equipment.

AARON MACHINERY CO., INC.
45 Crosby Street
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WANTED TO BUY

All or part ownership of a building material plant, ready-mixed plant or block plant in town of 25,000 or larger. Give details of equipment, business prospects, competition.

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—POSITIONS VACANT—

LONG-ESTABLISHED MACHINERY MANUFACTURER IN EASTERN PENNA.

wants

Engineers, Designers, Draftsmen, and Estimators. Experience on Cement, Lime and other Rock Products Plants is desirable.

Your reply giving outline of experience, salary required, etc., will receive prompt consideration and be held confidential. If an interview is requested by us, transportation expenses will be reimbursed. Location in home office, Wilkes-Barre, Pa. Write Box D-84, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CEMENT CHEMIST WANTED

Portland Cement manufacturer has an opening for a chemist experienced in all phases of cement manufacturing. In reply give personal information and experience. All inquiries strictly confidential. Reply to box number D-94, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

OPPORTUNITY OFFERED

Plant Superintendent needed by national cement manufacturer. Permanent position with excellent future. Our own people know of this ad. Outline experience and give salary requirements and references with reply.
Write Box D-75, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

PLANT SUPERINTENDENT

wanted for modern concrete block plant in the Metropolitan area of New York.
Salary and bonus, apartment outside of plant available.
Qualified operating and maintenance supervisor required. State education, age, experience and salary expected.

LOUGHLIN & GOETZ, INC.
90-79 Sutphin Blvd. Jamaica, N. Y.

WANTED
CEMENT PLANT ENGINEER

Must be widely experienced in
LAYOUT—DETAIL—CONSTRUCTION
Temporary Work
Age Limit 40 to 60
Write Box D-85, c/o Rock Products
309 W. Jackson Blvd., Chicago 6, Ill.

PLANT SUPERINTENDENT—For a Concrete Products Plant. Must be an aggressive producer, good organizer, and be able to install, maintain and operate all kinds of equipment. Millwright experience desirable. Excellent opportunity in a young firm with a big expansion program just starting. Write Box D-100, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED—Chemical Engineer. Research man familiar with the manufacture of lime and limestone products. We want a man familiar with the industrial uses of the product and who is capable of developing new products and new methods of manufacture. Small growing concern, located in the East. Good starting salary with participation in profits of new developments. Write Box D-88, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FIELD ENGINEER familiar with cement mill practice and cement technology for technical sales service to cement manufacturers. Write Box D-90, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED

General manager and plant superintendent for modern long established industrial sand and gravel plant in New Jersey. An exceptional opportunity for man with experience and ability who can get maximum production and maintain quality and equipment. Answer must give complete details of past employment, education, age, salary expected and general description of yourself with a recent photograph.

Write Box D-87, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CEMENT ENGINEER WANTED

Established Portland Cement Co. desires to secure the services of a competent engineer experienced in cement equipment, plant layout and operation. Work involves engineering and economic study of possible changes and rehabilitation of present plants. Experience more important than age. Salary depends upon experience and ability. Interesting work for the right man. Our organization knows of this ad. Reply to box number D-95, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

OPERATING FOREMAN to operate and supervise the operation and maintenance of wet and dry grinding and processing plant located in the East. Should be familiar with operation of air separators, tube mills, wet classification, filtering and drying equipment. Experience in cement mills or allied fields very essential. Please give experience and salary requirements in reply. Write Box D-89, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

—POSITIONS WANTED—

POSITION WANTED

American recently engaged in design and erection of South American plant is now available for position as Superintendent; many years and wide experience in cement manufacture—both processes. Write Box D-99, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

POSITION WANTED — Superintendent of Sand & Gravel Operation. Member A.S.M.E. Age 49. Aggressive. Experienced in every phase including dredging, drying, pulverizing, Air Separation, etc. Able to design, build & operate any size plant. Write Box D-98, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

ENGINEER, graduate—desires position as plant superintendent or engineer. 15 years' experience in mining, quarrying, crushing, grinding and processing, and in plant design and construction. Reliable, responsible. Will build an effective organization. Write Box D-77, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FORMER ARMY MAJOR with twenty years' experience as chief chemist and assistant chief chemist in modern cement plant desires a position, preferably the west coast. Am willing to go to Mexico or South America, if inducement is satisfactory. Write Box C-95, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

QUARRY SUPERINTENDENT wants work in the South. Now employed and best of References. Write Box D-91, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

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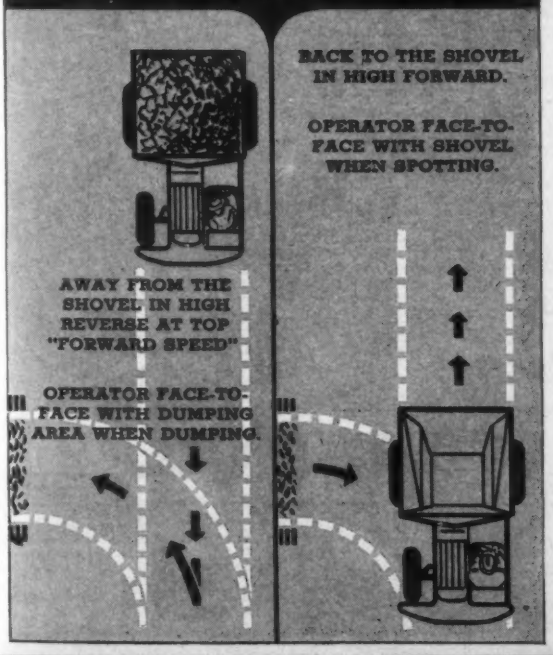
ELIMINATE SLOW TURNS IN THE TIGHT SPOTS

HOW DUMPTOR "*SHUTTLE*" RUNS SAVE MONEY ON TURNS . . .



Reverse isn't s-l-o-w with the Dumptor. Three reverse speeds are fast, just as fast as the three forward speeds. Saves time on short "shuttle" runs. High Reverse away from the shovel to grizzly or tipple. Then back to the shovel in High Forward. Two slow turns eliminated. (See diagram). On longer runs, fast reverse means faster backouts, faster turns. Check time for turns on your hauling job, then figure your gains with Dumptors on the job.

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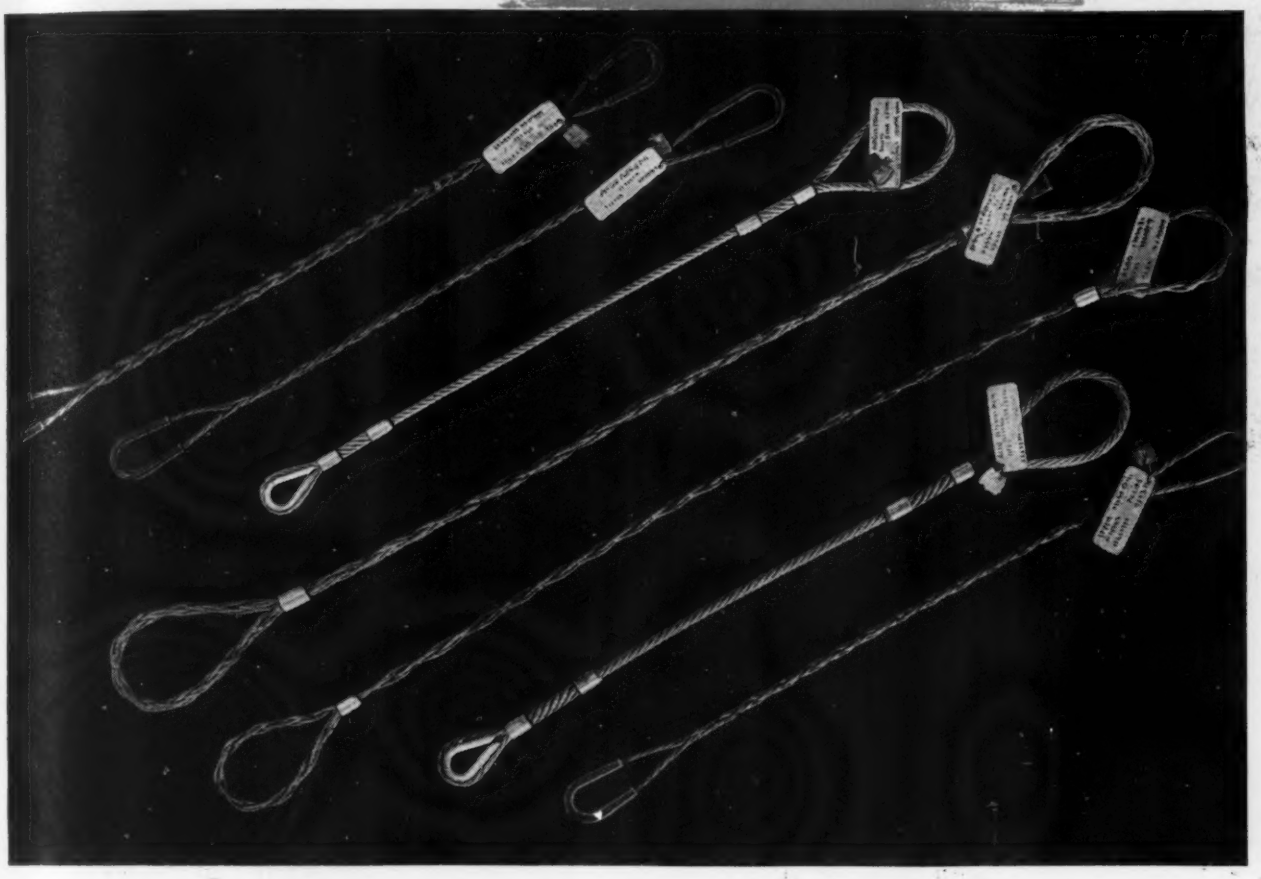

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